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SCIENCE AND TECHNOLOGY

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19 JUNE 1986

EUROPE REPORT

SCIENCE AND TECHNOLOGY

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WEST EUROPE/ADVANCED MATERIALS

BRIEFS

PIRELLI PATENTS NEW CABLE TECHNOLOGY--The Cavi Pirelli S.p.a. company has recently developed, at its Bicocca Research Laboratory, the first of a new family of materials capable of absorbing hydrogen at ambient temperature, completely and irreversibly, called Hydroget 1. This achievement, covered by patents, is of fundamental importance in the operation of optic fiber cables for telecommunications, in that it offers a reliable solution to the problem of attenuation of the transmission properties of the fibers as a result of the subsequent presence of hydrogen. In developing Hydroget 1, Pirelli, which has invested considerable sums of money in an intensive research effort on this problem, has borrowed from the advanced experience of the Rhone Poulenc Italiana company, which has been granted a manufacturing license for Italy. The first commercial application--for the underwater link between Venice's historical center and its Lido via a submarine optic fiber cable specially designed by the Cavi Pirelli company for SIP--has been a complete success. [Text] [Milan FATTI E NOTIZIE in Italian Feb 86 p 21] 9399/13104

CSO: 3698/427

WEST EUROPE/AEROSPACE

ARIANESPACE TOP PERFORMANCE BENEFITS ESA

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 29 Apr 86 p 5

[Article by ESA chief, Dr Reimar Luest: "With More Satellite Launches, Europe Wants to Strengthen Its Space Business: Arianespace Already Holds Half of the World Market on Commerical Satellite Launches"]

[Text] Editor's note: The following article is based on a speech given by the author on 25 April in Berlin within the framework of a function organized by the German Group of the International Chamber of Commerce. Dr Luest is chairman of the European Space Agency (ESA).

The economic exploitation of space is growing in importance. In the area of news satellites, satellite launches and earth stations alone, public and private investments from 1986 to 1990 will amount to over \$11 billion, according to the latest estimates by the OECD. The exploitation of space involves first of all telecommunications satellites. The most powerful news satellite that has yet been ordered is "Intelsat VI," weighing 2,200 kilograms, with a capacity of 36,000 telephone channels or 120 color television channels and with an expected lifetime of 10 years. As a consequence, the annual user fees for a single channel have dropped from \$32,000 to \$4,680 in just under two decades. The market for news satellites currently has a volume of approximately \$3 billion a year and is considerably larger than that if the necessary investments on earth are included. An estimate for the period from 1980 to 2000 indicates a rise by a factor of six.

At the beginning of the 1970s, communications satellites had a trailblazing effect because of their commercial and political significance. At the time, the area of communications was dominated by the Americans through their predominance in the international telecommunication satellite organization, Intelsat, an organization that was founded in 1964 and of which 110 countries are members and whose satellites are today used for two-thirds of all intercontinental telephone calls and a large part of television broadcasts.

Two More ECS Satellites

In Europe, the origins of satellite-based telecommunications go back to the Franco-German "Symphonie" project, which was then continued both within the

ESA and in national or bilateral programs. Thus, in June 1983, the ECS-1 European telecommunications satellite was successfully put into orbit from an Ariane 1, followed by ECS-2 in August 1984. Both satellites are today operated by the European telecommunications satellite organization, Eutelsat, a new international organization that was established by the European postal administrations specifically to promote telecommunication operations via satellite. Before the beginning of next year, the ESA will make ready two more of its ECS satellites in order to thus assure sufficient capacity for telephone communication, the broadcast of television programs and data transmission for Europe.

Within the context of ESA, two Marecs satellites, derived from ECS satellites and specialized for maritime telecommunication, have been developed; these allow connections between ships and coastal stations via satellite. After their successful launch, they will be operated by the International Organization for Maritime Telecommunication with Inmarsat satellites, the services of which will be enlisted by more than 4,300 users (ships and drilling platforms). The Marecs satellites designed and developed within the framework of ESA are included in the worldwide Inmarsat network.

However, Inmarsat does not want to limit itself in the future to navigation. Passengers should also be able in the future to make telephone calls or send telegrams from airplanes as well. Satellites could lead to improvements not only in air traffic control; air routes could be better planned using them, thus contributing to a savings in energy. Navigational help using satellites is also of interest to other mobile participants, such as land vehicles. The tendency towards flexible use also makes higher expenditures on satellites necessary. Thus, a communications satellite known as "Olympus" is currently being developed in the ESA, which is not only being considered for the direct emission of radio and television broadcasts, but can also be used for special radio services and business communications. In terms of its transmission capacity, Olympus will be the most powerful telecommunications satellite in the world.

Outside ESA, various national efforts are also being undertaken in this rapidly expanding area. This year, the first TV-SAT and TDF-1 direct transmission radio satellites are to be launched. The German postal service has also commissioned a national telecommunications satellite, the DFS-Kopernikus. Independent projects are similarly being pursued in Sweden with "Tele-x" and in Italy with "Italsat." The reasons for this are the new possibilities emerging from these satellites for direct television and radio transmission, rapid data transmission--especially for banks, insurance firms and large companies--and the distribution of "electronic" newspapers.

There are numerous practical applications of earth reconnaissance from space which are also of considerable significance economically. Examples of this are the monitoring of pollution, sea and coastal surveillance, geological reconnaissance and cartography. Weather satellites also belong in this category. You can all see pictures on the television news weather forecast that were produced with the help of the ESA Meteosat satellite. Meteosat began more than 12 years ago as an experimental program and has in the meantime developed into a fully operational system. In addition, the European

Weather Satellite Organization "Eumetsat" was specifically founded to use satellite technology developed in Europe for European weather services and see to it that meteorologists have satellites at their disposal in the coming decade as well.

There is also a growing amount of competition between Europe and the United States in the area of earth reconnaissance. France signalled a new beginning in this with the "Spot" satellite, launched in February. The camera on board Spot has a resolution of 10 meters, and its photographs are marketed internationally by a company set up specifically for that purpose, Spot-Image. It is as yet unclear to what extent commercial activities in this realm are possible. According to a recently published study by the OECD, the international market volume for long-range reconnaissance is estimated at one billion dollars for 1990.

Observation Independent of Weather

The ESA as well is in the process of developing an ERS-1 long-range reconnaissance satellite that should be deployed by 1989. This satellite will be equipped with microwave sensors that make possible observations of the oceans, glacial movements and the coastal regions, independent of the weather. ERS-1 could thus become important for offshore activities, for fishing and for navigation.

The exploitation of zero gravity could also be of increasing significance. Here there are quite different areas that could profit in both research and later in the application of this aspect:

- Materials research and process engineering
- Chemical processes
- Liquid and gas physics
- Pharmacology
- Biosciences

The Spacelab developed by the ESA offers the first opportunities in this. Spacelab has in the meantime been used three more times with two missions by NASA and the D1 mission of the FRG. This mission justifiably attracted a great deal of attention; 76 experiments were on board, of which 42 originated in the FRG. Naturally, it is too early to expect the results of the experiments; data for 74 of the 76 experiments remains to be analyzed.

Particularly in the United States and Japan, potential industrial applications are of primary importance in the selection of experiments. In contrast, Europe has thus far concentrated almost exclusively on basic research. However, various areas are emerging that could be of industrial interest, such as the production of glass for optical communications systems or the production of chemically homogenous semiconducting crystals.

As important as it is to develop and build satellites for communication or for earth reconnaissance, it is just as important to put these satellites into the appropriate orbit. Without its own access to space, Europe would not be able to compete in the satellite business. With Ariane, the Europeans have succeeded in breaking through the American monopoly on carrier rockets, using French system guidance. The 14 successful Ariane launches, through which 21 satellites have been put in their desired orbits, confirm the efficiency of the Europeans. The Ariane is now being managed commercially by Arianespace, a private company, in which the leading European air and space companies, electronics companies, several banks and the French space agency CNES are participating. After the defrayment of developmental costs by the member states of the ESA, Arianespace must now cover all other costs through payments from its customers.

Already 44 Solid Bookings

Even before the Challenger space shuttle accident, Arianespace had succeeded in winning over half of the market for commercial satellite launches. Thus far, there are 44 solid bookings, valued at approximately DM 3.8 billion. The Ariane family today includes three--soon to be four--versions with different payload capacities. With the inauguration of the second launch complex in Kourou, French Guiana, the launch capacity has also been increasing considerably. In order for Europe to remain competitive and autonomous in the next 10 years in the area of transport systems, a new version of the Ariane, the Ariane 5, with a large cryogenic propulsion unit is to be developed and be ready for launch in 1995. It would then be able to put a payload of 4.4 tons into geostationary orbit and a payload of approximately 15 tons into close orbit, whereby the maximum diameter is expanded to 4.6 meters. In this way, Europe is attempting to counter expected competition from Japan and China, who want to offer competitive carrier systems in the 1990s.

The activities in space and its exploitation have lead to the emergence of a new market with a variety of products. Last year (1985), the total turnover of American industry in the area of space amounted to between \$15 and \$20 billion. In Europe, the corresponding figure was approximately 10 to 12 percent of this amount (approximately \$1.6 billion), while in Japan it was 5 to 6 percent. It is clear that Europe and European industry cannot ignore the space market.

It is true that the projects that Europe has thus far successfully launched--scientific satellites, communications satellites, meteorological satellites, the development of Spacelab as well as the Ariane carrier rockets--have not brought Europe up to par with the two superpowers in space across the board; they have, however, made it possible for Europe to compete in every one of these areas through peak performance and to gain a certain amount of autonomy. This is of importance to Europe not only in economic terms, but also in political terms.

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WEST EUROPE/BIOTECHNOLOGY

NEW FRENCH BIOTECH RESEARCH CENTER, BIOTECH FIRM

Paris LE FIGARO in French 18 Apr p 18

[Article by Jean-Louis Peytavin: "Biotechnology At Investment Time"]

[Text] Although biotechnology, i.e., all the techniques concerned with the use of living material for industrial purposes, such as, for example, the production of new drugs secreted by bacteria, has recently attracted public attention, it has nevertheless not been heavily invested in by French financial decision-makers. This is a prudent attitude, because in this new area, the cost of research and development is sufficiently high that no profits will be realized before several years have passed.

However, the situation may change rapidly, with not only the investments of Elf-Aquitaine (Labege Research Center at Toulouse), Roussel-Uclaf and the French Petroleum Institute, but also Poulenc, which has just announced the creation of a new biotechnology research facility, endowed with 200 million francs. This center, which will be set up on the Poulenc site at Vitry, will employ 200 researchers and will be operational in 1988.

Technology Transfer

It will carry out research in areas including genetic engineering, biochemical engineering, and industrial microbiology, and it will coordinate research currently being carried out in the health, chemistry, and agrochemistry divisions of the group. Recall that Poulenc Sante already has significant resources available in the area of biotechnology with the Institute, and it will spend 1.3 billion francs on research and development of new drugs for human use.

Compared to the resources available to Poulenc, a company like Bioeurope, created in 1984, is a minuscule PME although it has from the beginning combined the advantages of venture capital with university research. In fact, the company, founded by Jean-Bernard Borfiga, who previously managed biotechnology activities of the American group, Corning, in Europe, Australia, and Japan, counts among its stockholders both manufacturers (Roussel-Uclaf, Sucre-Union) and financiers (Banexi, Agricole, Citicorp Venture Capital, Compagnie financiere de Suez) and carries out only contract research, under the management of Pierre Monsan, a specialist in enzymatic catalysis and a

defector from INSA [National Agricultural Science Institute] of Toulouse. Bioeurope currently employs 20 researchers, and sales totaled 10 million francs during its first business year.

Bioeurope, in contrast to its competitors who have specialized in genetic engineering and diagnostics, particularly monoclonal antibodies, has launched into enzyme technology, the industrial applications of which are more immediate (extraction of antibiotic molecules, separation of milk proteins, synthesis of new molecules) and the formulation of special ingredients, particularly flavors used in the food industry.

Bioeurope has a research team in Toulouse, and in Paris, a highly specialized international marketing team which is absolutely essential in an area where markets exist only on a world scale. J-B. Borfiga hopes to restore the budget balance beginning in 1988 and will invite the participation of new investors at the end of 1986 (in comparison, one of the largest biotechnology firms, the American company Genentech, has sales of \$60 million, for a market capitalization equivalent to \$800 million).

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WEST EUROPE/BIOTECHNOLOGY

FINNISH FIRM GETS WORLDWIDE PATENTS, DU PONT CONTRACT, BACKING

Helsinki UUSI SUOMI in Finnish 9 Apr 86 p 22

[Article by Sinikka Mustonen]

[Text] The Orion pharmaceuticals plant genetic technology project team has developed an extensive technique that has been patented throughout the world. The company has already reached a cooperative agreement with the multinational Du Pont combine which they believe will be a profitable one.

Based on genetic technology, the new technique will make possible as early as this year a test that reveals the presence of AIDS; it will make possible really positive paternity examinations, reveal the identity of a criminal, with unequivocal certainty account for a small drop of blood or a hair, help in diagnosing cancer,....

"This nucleic acid strata hybridization technique offers many possibilities. We have just now developed a so-called first-generation technique and it will take some time before applications of it are commonplace," special lecturer Marjut Ranki, the head of the project, said.

Orion has in 3 years time invested 14 million markkas in the project. Through the contract signed last week with the Du Pont combine, the initial fee for the license rights alone is over 5 million markkas. Furthermore, Orion will have rights to sizable royalties later on.

At Orion they will be developing different sorts of possible applications of the technique itself; at Du Pont they will be developing the technical equipment and facilities for it and the tracers.

"This research team has superior know-how in this sector in the world," general manager Olavi Larma said.

From AIDS to Organ Transplants

Perhaps most urgently needed are new methods of testing to identify the HTLV-III virus that causes AIDS. Some of the carriers of the virus do not develop antibodies, which would be detectable with the current tests. However, these individuals infect others with the virus and their blood containing the virus gets by blood bank tests.

The first application of the strata hybridization technique may be in use as early as this year. Especially Du Pont is particularly interested in the new kind of AIDS test -- and there would be a huge market for it in the United States where hardly anyone dares to make use of the blood banks any more.

This test is capable of indicating the presence of the virus, even though the blood sample would be considered to be pure with the present-day tests.

The papilloma virus is a wart virus and it may cause cancer of the cervix. Up to now they have not been able to tell from a wart whether it contains the papilloma virus or not. With this technique they can evaluate the risk of cancer.

There are altogether about 800 different kinds of subtypes of cancer. However, a growth must always be accurately typed so that treatment may be exactly suited to that type. They believe that the nucleic acid strata hybridization technique will become a precise instrument in dealing with this problem.

It can also be used to diagnose different kinds of hereditary diseases. They also get a great deal of help from this for organ transplants in determining tissue compatibility and in preventing rejection.

Crooks Caught

Aside from its many medical applications, help is also anticipated from the technique for forensic medicine. While up to now it has been sufficient for a burglar to wear gloves, in future he will apparently have to cloak himself in a plastic bag.

By means of the new technique it can be clearly stated with regard to many a doubtful case that this is the culprit. They need find no more than a hair, a drop of blood or a bit of dandruff at the scene of the crime; a genetic analysis will determine the person to whom it belongs.

"Forensic medicine will in the near future change our identification techniques. An accurate DNA "fingerprint" will clearly tell us, for example, who the father of a child is, who the perpetrator of a crime is, etc.," special lecturer Marjut Ranki told us.

DNA Strands Separated and Together

In nucleic acid strata hybridization the nature of the twin strands of DNA, which are separated from one another by cooking them out of the DN solution, is exploited. DNA, a test sample, provided with a suitable tracer is added to the mixture from outside. After that, they can observe how the sample replicates the specimen DNA.

"We use genes isolated by genetic technology methods as the specimen DNA and a radioactive substance or enzymes as the tracer," special lecturer Hans Soderlund said.

"With the simplification of complicated procedures, they will also come into use by hospitals. The presence of a given gene can now be verified by the hybridization technique and its quantity measured. Research will later demonstrate which areas will benefit from this," Soderlund said.

Olavi Larma, the general manager of the Orion pharmaceuticals plant, is of the opinion that new medicines can also be developed through the further application of the technique. They have already been able to improve the production of both insulin and interferon through the genetic technology technique.

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19 June 1986

WEST EUROPE/BIOTECHNOLOGY

DANISH NOVO, NORDISK GENTOFTE FACE LEGAL BATTLES, DEBATES

Copenhagen WEEKENDAVISEN in Danish 18-23 Apr 86 pp 1, 3

[Article by Ojvind Kyro: "Biotechnology Industries Tired of Criticism"; first paragraph is WEEKENDAVISEN introduction]

[Text] A bomb threat, complex legislation, a lack of expertise in the Environmental Affairs Ministry and the skepticism of environmentalists and others with regard to gene splicing have now led the two biggest biotechnology firms in Denmark to criticize those around them.

The two drug giants, Novo and Nordisk Gentofte, both poised to start production based on gene splicing, are tired of their critics and the legislators.

After a heated debate in the last half year that included angry citizens' meetings, goodwill trips for members of Folketing, debate articles containing sharp arguments and a Folketing debate that resulted in stopping several permits and the introduction of no less than two bills, spokesmen for the two firms now say that the government and Folketing are being difficult, the authorities are incompetent and the critics lack any basis for their skepticism.

Nordisk Gentofte received a bomb threat involving one of its buildings which it shares with another firm. The bomb threat was made after a heated citizens' meeting in Gentofte last December concerning the new gene-splicing factory. "Reactions at the citizens' meeting and subsequent events illustrate the attitudes of some people in the area," said Ole Theilvig, technical director at Nordisk Gentofte.

The firm is afraid that it will lose a substantial share of the world market unless it can start production soon. But at the request of the environmental organization Noah, concerned citizens appealed the approval of the factory, and under the law there is no provision for how soon the appeal must be decided. Therefore the firm mentioned in December that it might move production to England unless a verdict was handed down soon.

Director Theilvig said: "We are working at high speed to answer the questions raised in the appeal. Our production plant will be ready in October

and we hope that the case will be decided by then. We expect to get final approval for the medicine by the end of the year and we must start production this summer in order to build up a supply."

Where will the production take place?

"No comment. But we have taken precautions."

Neoromanticism

Novo also feels the debate on the dangers of gene splicing has been beside the point. "All the risk scenarios so far have been inaccurate. It is as if people fear that something mysterious might happen. Frost-resistant bacteria, for example, are the most harmless things in the world. The widespread fear of the bacteria illustrates how the ignorant segment of the population has allowed itself to be deceived," said research chief Erik D. Laursen.

The "frost-resistant bacteria" referred to by Erik D. Laursen have become a major issue for those who are skeptical of gene-splicing technology both in the United States and in this country. An American firm has changed the genetic makeup of the bacteria that form ice crystals in strawberry plants and the question is whether laboratory research provides adequate certainty that the gene-spliced bacteria will not spread unchecked outside the laboratory. The first application of gene-spliced organisms has been delayed time after time because American environmentalists have appealed the case to the EPA, the American Environmental Protection Agency, among others.

"The fact that the EPA is still considering the matter shows that some people are making a career of protesting," said Novo's research leader, who continued: "It is neoromanticism to think that one can solve all environmental problems or avoid risks regardless of the cost. With that kind of attitude, fire would have been banned from the start."

Noah spokesman Jesper Toft, a city planner, is surprised by these statements: "We have requested a dialogue with industry time after time, but we have only run into a wall of secrecy. Novo and Nordisk Gentofte have been very reluctant about attending citizens' meetings and when they did they were unable to calm the fears of the public. Their risk analyses are also secret and we have refused to give them a blank check of approval and have therefore appealed the approval.

"It is unreasonable to call us neoromantics," continued Jesper Toft, "for we all know that in recent years there have been many environmental scandals and we ought to learn something from them. We must look ahead and not just jump on a moving train because industry asks us to."

Two Bills

Environmental Affairs Minister Christian Christensen (Christian People's Party) was asked in February by an almost unanimous Folketing to come up with a bill on gene splicing and on 2 April two were presented. One by the environmental affairs minister and one by the agricultural minister.

"It seems strange to have two legislative proposals," said Novo research chief Laursen. "It shows something is wrong when the two ministries cannot agree. The laws will delay our planned production for they say that everything is forbidden in advance and for this reason I fear that even minor matters will require a lengthy discussion."

Director Theilvig of Nordisk Gentofte considers the environmental affairs minister's bill totally unnecessary: "If they had just added the word 'biotechnology' to the existing environmental law it would have been sufficient. But the bill is so similar to the present environmental protection law that it won't do any harm."

He also criticized the ministry's preliminary work on the bill: "We made a number of comments on the Environmental Affairs Ministry's draft of the bill. It simply did not hang together and it was full of misconceptions because it was not carefully prepared."

Erik D. Laursen of Novo said of the ministry's experts: "They don't have an easy job."

Insecure

The environmental affairs minister's experts on gene splicing are found in the Food Agency. Section leader Lene Witte said: "We prepared the rough draft of the law as well as we could. The reason why there are two bills is that we are safeguarding our interests and the Agricultural Ministry people are safeguarding theirs. But we have coordinated the bills and we will work out cooperative agreements so that both laws can be administered as flexibly as possible. Incidentally we are building up our technical expertise and I hope we will end up with a staff of around 20 experts."

Socialist People's Party spokesman Kjeld Rahbaek Møller does not understand the dissatisfaction expressed by Novo and Nordisk Gentofte: "It should be to their advantage to have clear rules instead of leaving everything up in the air. When something new is being introduced, there must be an open debate beforehand. But when the authorities are poorly equipped and lack expertise, people feel insecure. It is important to have a debate on biotechnology--especially with regard to the ethical question of how far one should go when it comes to manipulating plants and animals."

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WEST EUROPE/CIVIL AVIATION

UK COSSOR EYING DM 120 MILLION MONOPULSE SSR SYSTEM FOR FRG

Duesseldorf HANDELSBLATT in German 6 May 86 p 14

[Unattributed article: "Cossor Electronics/Specialized in Air Traffic Control-- Britons Want To Modernize German Radar Network"]

[Text] Harlow/Essex. The Federal Office for Air Traffic Control [Bundesanstalt fuer Flugsicherung (BFS)] in Frankfurt is currently studying the modernization of FRG radar equipment in order to further improve flight safety.

The BFS has solicited and obtained information from the French firm Thomson CSF, the British firms Marconi and Cossor Electronics Ltd, as well as from the Cossor parent company, Raytheon, a United States electronics concern, and in addition from the American firm Westinghouse and the Italian firm Selenia. AEG [Allgemeine Elektrizitaets-Gesellschaft] has not yet replied.

The Cossor management sees possibilities for being awarded the BFS contract, which is valued at DM 120 million. The following timetable is envisioned: In late 1986/early 1987 the BFS could issue a declaration of intent, following its decision in favor of the so-called monopulse SSR system from Cossor. The delivery contract could then be signed at the end of 1987, and deliveries could begin at the end of 1988. The BFS is counting on an extended delivery period.

The Cossor managers feel that in monopulse SSR they have a particularly attractive entry in the field. This is an omnidirectional secondary radar system (SSR = Secondary Surveillance Radar), in which so-called transponders on board the illuminated aircraft automatically respond to impacting radar beams from the ground with the transmission of a code for identification as well as altitude. In addition, the SSR, just like the older primary radar system, provides azimuth and range of the illuminated aircraft, so that the radar receives four informational items about one aircraft through measurement from outside.

The monopulse SSR system developed by Cossor eliminates a serious shortcoming of older radar systems: Since a single impulse from an aircraft transponder suffices for the system, a directional data item on the air controller's visual display is not the product of averaging a number of different signals but of a single signal. This prevents the "track wander," the interruption of the flight path line on the scope, and the so-called skipping of the radar target.

In conjunction with a so-called "plot extractor," two other disadvantages are avoided: Even with two objects flying close together (formation flight), the transponder signals of the two aircraft can be distinguished on the basis of the differences in strength and the angle of incidence. And, finally, spurious signals caused by high-rise buildings, towers and hills--their location known, of course--can also be eliminated. The elimination of the three cited standard errors of older radar systems not only increases flight safety but also the capacity of airspaces with high traffic density.

The introduction of monopulse SSR will not necessitate any changes in the transponder equipment in the aircraft. This would become necessary only if the new system were further developed in a succeeding stage, which would be characterized by the following: The radar, using a specific identification code consisting of 24 different pulses, triggers only the response of a very specific (selected) aircraft. In that way radio overlapping and interference because of spurious reflections become completely unlikely. This does, to be sure, require all aircraft, down to the small sports plane, to be equipped with a new type of transponder. According to a BFS spokesman, the introduction of this new transponder could take place in the mid-1990's at the earliest.

If Cossor should be awarded the BFS contract, this would naturally be a highly welcome addition to its list of references for the firm, which in 1985 received orders for 34 million pounds sterling and had sales (30 percent of them for exports) of circa 46 million pounds sterling (DM 154 million), and whose total orders on hand at the end of the year were worth 68 million pounds sterling. This list [of references] currently includes such solvent clients as the Civil Aviation Authority and the Royal Air Force in Great Britain, but also Canada (41 equipment sets ordered) and 7 additional overseas countries. The firm, which already before the war worked together with the noted radar inventor Watson Watt, was acquired by Raytheon in 1961/62 and in 1981 moved into new buildings on grounds measuring 8 hectares [80,000 square meters] in size in Harlow/Essex, where circa 1,000 persons are currently employed.

12689/12766

CSO: 3698/467

WEST EUROPE/CIVIL AVIATION

AIRBUS BUSINESS, DEVELOPMENTS, SUCCESSES

Promotion Negotiations Continue in June

Hamburg DEUTSCHE VERKEHRS-ZEITUNG in German 8 Apr 86 p 14

[Text] The governmental-level talks on the American changes of subsidization against the European Airbus consortium are to be continued in June. A place for these talks has not yet been determined, said Bruce Wilson, the American delegation chief, after the first informal conversation held recently in Geneva by government representatives of the United States, Great Britain, France and the FRG.

During the talks both sides had accepted the position that sales subsidies were to be avoided, said Wilson.

According to Wilson, the governments of the participating European countries have pumped at least \$7 billion into the Airbus project. If this support were to continue at this level, increased tensions in the commercial aircraft business could be expected, the American delegate threatened.

The United States claims that the European governments' financial assistance violates an agreement on the commercial aircraft business arrived at within the framework of GATT in 1979.

According to reports, it became apparent during the talks how difficult the reconciliation of the two positions is, despite assurances by both sides of a willingness to cooperate. The Europeans see no violation of the GATT agreement in the granting of repayable loans to the Airbus manufacturers, but rather a legitimate contribution toward assuring technical progress and its competitiveness vis-a-vis American suppliers, who, according to them, had almost a monopoly in the marketplace for long-range aircraft.

The governmental development loans to the French-German-British joint venture to date were estimated by the German representatives at DM 2.7 billion, by the French at Fr 8.74 billion, and by the British at 50 million pounds sterling.

In contrast thereto, it was claimed, American industry had in the last 15 years received research and delivery contracts from the state worth an

estimated \$47.5 billion. In addition, for exports the individual firms could also register profits running into the hundreds of millions of dollars per firm as a result of tax credits.



Also a good carrier for freight: the A-310

As detailed by the press and information office in Bonn in a recapitulation of the Airbus program, Airbus has thus far sold 500 aircraft to more than 50 clients on all continents, including 396 wide-body aircraft and 100 A-320 aircraft. Of the total sales of circa \$23 billion by the three major commercial aircraft manufacturers (Boeing, McDonnell Douglas, Airbus) last year, Airbus Industry accounted for circa 18 percent; with respect to wide-body aircraft, its share [of the sales] was circa 43 percent.

According to the Bonn paper, the Airbus program is burdened with high costs, particularly those stemming from the beginning phase. These costs consist of the expenditures for the development of the aircraft and the so-called pre-run costs of series production. A profit is realized when, as a result of the series run-up, the per unit costs can be pushed below the sales proceeds and the cost deficit previously registered can in this way be reduced.

In the process, the net profits of the Airbus program depend primarily on the prices attainable in hard competition with the American market-leader Boeing and on the dollar exchange rate.

Thus far the competition was hampered for Airbus by its substantially smaller model offering. The production rate--in terms of number of aircraft regardless of size--is currently still nearly nine times higher at Boeing.

The [Airbus] industry wants to improve its competitive position with the A-320 and with the further expansion of the Airbus family currently being prepared by a long-range aircraft (A-340) and a still larger medium-range aircraft (A-330).

Reliable statements regarding the point in time when the Airbus program will attain complete profitability are not yet possible at this time. According to reports, this will also depend on whether the world aviation market will develop as positively as the aircraft manufacturers and the airlines currently expect it to.

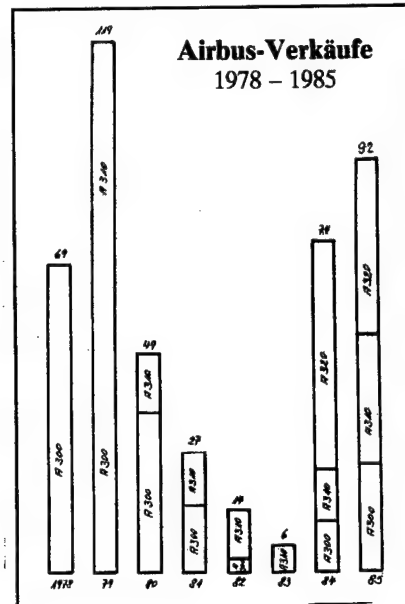
Here it will also be of importance for the Airbus whether it gains complete access to the United States market. To date it has only been possible to deliver fewer than 100 Airbus aircraft to the United States, whereas more than 1,000 American-produced aircraft are in service in Europe. Thus, for example, aircraft of American manufacture represent 93 percent of Lufthansa's fleet inventory.

According to the Bonn paper, repayment of the subsidies of the Federal government for the development of the Airbus program is to be keyed to the success rate, i.e., it is to go hand-in-hand with sales successes.

Basically, the Federal government is pursuing the goal of increasingly shifting the Airbus program to the responsibility of industry. Accordingly, the share of industry in the improvement programs was raised from 10 to 15 percent in recent years, for sureties a countersecurity by industry of 25 percent was introduced, and for the A-320 a capital investment in the amount of DM 115 million was made in German Airbus [Deutscher Airbus] by industry.

In the new A-330/340 program, as well, the assumption of an appropriate share of the responsibility by industry will be necessary. The total development costs of this program are estimated at \$2.6 billion, with the German share being circa one-third. Airbus Industry is currently preparing the profitability analysis, which must then be studied by the governments.

(See graph on following page)



Airbus Sales, 1978-1985

The Federal government would welcome an expansion of the Airbus program on a basis promising economic success. In doing so, it is, according to its own statements, giving consideration to the technological importance of the Airbus program, its high value for European cooperation, and the competitiveness that can be attained with it in the passenger aircraft market, which would otherwise be the almost exclusive domain of a single manufacturer.

The shares in the Airbus Industry, a firm under French law in Toulouse, comprise circa 38 percent for the FRG, 38 percent for France, 20 percent for Great Britain and 4 percent for Spain. The partners assume direct responsibility for obligations of the firm. While the French partner belongs to the French state, the other partners are either wholly or predominantly private firms.

The development and production work is divided among the Airbus firms and other partners, mainly in the Netherlands and Belgium. Final assembly is done in Toulouse. Each Airbus partner prefinances his own work and then share in the sales proceeds of Airbus Industry in accordance with fixed relationships.

Involved in the Airbus program are circa 23,000 highly qualified positions, of which 10,000 are in the FRG (Messerschmitt-Boelkow-Blohm, Dornier, and circa 200 middle-class subcontractor firms).

Indian Airlines Buys A-320

Hamburg DEUTSCHE VERKEHRS-ZEITUNG in German 5 Apr 86 p 7

[Text] Indian Airlines has signed a contract with Airbus Industry for the purchase of 19 A-320's as well as for options to buy an additional 12 aircraft. The total value of the contract for the 19 firmly ordered A-320's, including the associated spare parts, amounts to more than \$1 billion. The A-320 was selected by Indian Airlines primarily for use on the airline's domestic routes. The delivery of the aircraft to Indian Airlines will begin in April 1989. All 19 firmly ordered A-320's are to be in service by April 1990. Indian Airlines ordered its first A-300 from Airbus Industry in 1975. The airline currently has a fleet of ten A-300's in operation. According to an Airbus press release, Indian Airlines is the tenth customer for the A-320. The total number of firm orders of this aircraft is now 119.

12689/12858
CSO: 3698/468

WEST EUROPE/COMPUTERS

THOMSON'S INDUSTRY, ENGINEERING BRANCH REORGANIZED

Paris, L'USINE NOUVELLE in French 10 Apr 86 pp 34-35

[Article by Claude Amalric; first paragraph is introduction]

[Text] The iron hand of Noel Goutard was needed to make a heterogeneous conglomeration of marginal or deeply indebted firms into a sound Thomson division which is earning a profit in 1986. He pulled off this long shot in 3 years.

Still another Thomson activity has made a miraculous recovery: the Industrial and Engineering Division (BII), which achieved a balanced budget in 1985 with 9,000 employees and a turnover of Fr 10 billion; it has achieved a similar turnover in 1983, but with 16,000 employees... and a loss of 350 million!

When Noel Goutard, general manager of the Thomson group, took personal charge of the Industrial and Engineering Division in 1983 to try to rescue it, he found "a division undermined by large, poorly negotiated contracts and acute problems to be solved," superfluous and unmotivated efforts, training and supervision in need of correction, not to mention industrial equipment: there were 17 factories, half of which were fit only to be shut down. This dark picture was supplemented by the lack of a common goal for the 30-odd ill-assorted firms of the division. There were not even up-to-date and uniform accounting methods for managing these firms, most of which were leftovers from previous restructurings.

The question was whether to trim or to rebuild entirely. Having decided to make BII a source of profits, but confronted with the extent of the task, Noel Goutard decided to do it himself. Priority was given to personnel. A body of 70 high-level managers was set up, directing 2,000 supervisors, 700 of whom had been hired since 1983. At the same time, the businesses were regrouped into seven fields of activity: copper, commerce, armament, engineering, professional television, instruments, and informatics services. In each activity the special fields are clearly specified in accordance with market demand, such as digital studio television, guided ammunition, and above all production automation and its software. This is a business for a growing market of several billion dollars 5 years from now. The Japanese have been working in this field since 1976. "Computer-programmed workshops are starting up in Europe: 15 or so today, twice that number in 1990. We want to be a part of this."

For this purpose, in 1984 the TAI subsidiary of Sodeteg set up a "computer-programmed workshop" team of several dozen engineers, while Sodeteg converted from a general firm to a real engineering firm with a team for assistance and consulting services to clients, among others in production automation.

For its part Thomson Informatics Services (TIS) was assigned to go from design of management software to design of CAO and off-line computerized production software (GPAO). Noel Goutard stresses the importance of this orientation of BII: "We absolutely must go the way of computerized production. To do this we have business relations with computer manufacturers and the great go-betweens"--such as General Electric, which has invested \$1.5 billion in production automation, and General Motors, writer of the MAP program for which it had to spend \$1 billion.

There remained the task of creating up-to-date management for sensing, treating and producing quantified data on markets, products and personnel.

With the managers of activities, Noel Goutard worked out a development plan for computerized management which can produce the correct parameters at the right time. "I value it a lot: One cannot deal with an internal matter or with a client unless one has useful figures. If one does, agreement is reached very rapidly."

In 1984 a complete recovery plan was announced to the whole division. Eight main lines of action can be drawn from this, most of which are already being carried out: concentration of activities; strengthening and training of supervisory staff; reduction of the work force to 9,000 employees to start with; improving efficiency of industrial equipment; setting up internal networks for finances, personnel and legal matters; accounting; modernization of products; development of a European commercial network. "It was the common goal which was missing if BII was to become a high-performance division confident of the future."

Once the assignment was specified, responsibility was decentralized and each person was put at the head of a profit center to be managed according to his means and position. One year later the results are in. "We saved Fr 1.5 billion in 1985 on working capital, and productivity improved 60 percent: from Fr 800,000 to Fr 1.4 million per man-year. As good as IBM or Hewlett Packard!" Noel Goutard can be proud.

The cost of restructuring--including that of letting personnel go and the modernization of factories--increased the BII deficit, which was Fr 750 million in 1984. "This is 616 million under the present perimeter of consolidation," explains Noel Goutard, because, for reasons of synergy, aeronautical equipment (Auxilec, Bronzavia and Semca) was transferred to the "equipment and systems" division of the group.

"Fifty Major Risks Managed Without Great Difficulty"

Other activities such as Saphymo-Stel have been sold. It is also suitable to include in this result provision for covering inherent risks of new contracts...

and old ones. "We drew up a table of 50 major risks which together came to Fr 2.5 billion. Then, week after week, we managed them... without great difficulty." Actually, the management made sure that all technical, legal and financial procedures and deadlines were observed and that positions were properly filled.

Noel Goutard is too modest. One half of these risks, he said, "we created ourselves"--by putting right the means of production, among others. Of 17 factories to start with, only 8 survived following modernization; 7 disappeared, 6 of them in 1985. And 2 were erected; they are to be inaugurated this coming June in accordance with the plan.

The "power transmitter" activity (LGT) will leave its quarters in Gennevilliers and Chatou to settle at the conflans-Sainte-Honorine unit (Fr 180 million), built in 1 year. "This equipment was needed by LGT, which was losing 150 million per year in 1984 with an outdated range of products and which has recovered magnificently with these new transmitters. It is now at the point of becoming second or first in the world, competing with NEC, while RCA gave up in October 1985." LGT, now in the black, forms together with TVE (television sets) an activity having 1.5 billion in sales per year.

TVE presents the same picture: "It fights with the Japanese and often wins, while Philips is discouraged and sells its competing division to Bosch." TVE is not yet out of the woods but its competitive efforts are praiseworthy. "We support them, and they know it. Just as long as each firm lives up to its agreements, we back it financially."

Sodeteg, which was the nightmare of the division when Thomson tried unsuccessfully to sell it, is now a pillar of BII with a turnover of 2.2 billion. Sums of 100 last year and 200 million in 1986 will beef up Sodeteg's capital, weakened by 330 million in previous debts.

All these firms or activities have brought their range of products up to date, as demanded by the 1984 plan. Cameca is reconquering scientific instruments with its electronic sensors; Brandt Armament (1.8 billion in turnover) has done the same for its mortars and its ammunition--including the BAP 100, or anti-runway bomb.

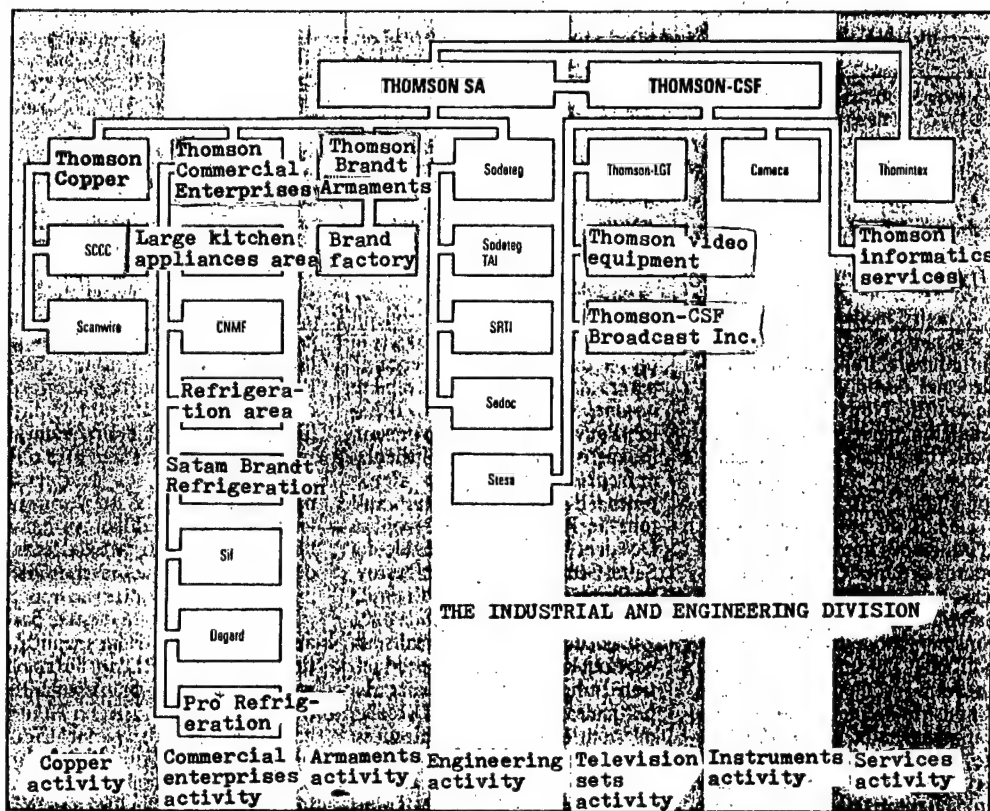
However, the most important activity of BII in terms of turnover (about 2.5 billion) is... special copper for the electrical industry. An ancient heritage. Could it be brought up to date? "It is first in Europe, with 50,000 metric tons per year. The Chauny factory is at least as modern as those of the Japanese. Thomson Copper was losing 80 million per year. Today its personnel is proud of the profits." In the meantime, it is true, the costly Darnetal factory has been shut down.

Be First in Europe, Even if it Means that Small Firms Are Taken Over

Noel Goutard and his team will not stop there. They will increasingly bring about synergy with the other divisions: Despite the variety of BII's businesses, production automation may be of interest to the entire group. "[We want] to be

first or second in Europe in our fields, even if it means that small firms are taken over"; this is an allusion to Thomson Copper, which faces 40 unprofitable competitors. And to continue to expand with the help, if necessary, of international agreements, such as TBA's agreement with Martin Marietta and the German Diehl firm. Strengthening of marketing and new factories are the projects immediately ahead, going hand in hand with "stopping low-return activities and reclassifying 20 percent of the personnel in order to arrive at a figure of 8,000 employees." That is the condition for being "big but highly maneuverable," Noel Goutard concludes.

He took drastic action, and if necessary will continue to do so. At this price the billion francs invested by Thomson in BII will be recovered in record time. "BII: recovery confirmed" was the terse statement made 2 months ago by Alain Gomez, chief executive officer of Thomson. All of the above was implied by these three words.



Realignment into Seven Fields of Activity

5586/12232

CSO: 3698/448

WEST EUROPE/DEFENSE INDUSTRIES

FRANCE ANNOUNCES HELIOS MILITARY SPACE RECONNAISSANCE SYSTEM

PM021517 Paris LE FIGARO in French 16 Apr 86 p 12

[Jean-Paul Croize report: "France's Eye on World's Hotbeds of Tension"]

[Text] In 1992 France will, in theory, have a network of spy satellites which will enable the military to know everything which is happening on the surface of the earth, as is now the case for the two superpowers. Aerospatiale Chairman Henri Martre has just confirmed this by announcing that the government has given his firm the mission of supervising the construction of this space reconnaissance system, called "Helios." It is a system which promises to be complex. It will comprise three or four satellites and several ground-based reception stations. This explains an investment which is estimated to be nearly Fr10 billion for a "ready-to-use" system...

"Our spy satellites will be constructed on the same principles as the French civilian Spot system, but they will use more advanced technology particularly a different, highly sophisticated optical system to improve the sharpness of their vision" Henri Martre explained, taking the opportunity of a seminar held in Estoril (Portugal) to lift a corner of the veil over this program which has so far been kept very secret.

Indeed, for several years the Defense Ministry and the general delegation for armaments have been fairly openly announcing their intention to turn France into the third nation in the world to have a "space reconnaissance and observation system"--to use the customary expression. But statements had hitherto been ambiguous, closer to simple declarations of intent than to an officially established decision.

In fact, as Henri Martre revealed, the Helios program--the name of which comes from the heliosynchronous [heliosynchrone] position which the French spy satellites will occupy in orbit--has been a reality since the beginning of the year, when Aerospatiale was appointed to implement the project, in other words was made responsible for the construction of the complete system, satellites and ground stations...

Without going so far as to reveal the sharpness of vision--the resolution--with which Helios will be equipped (this information would enable potential enemies, he explained, to adapt their means of camouflage accordingly) the Aerospatiale chairman said that our spy satellites will be able to see "enough to meet the country's strategic needs, which are to have constant information on the development of the potential threat."

High-level Diplomacy

In other words, the Helios system will make it possible to detect any movement of equipment or the appearance of any new infrastructure and to understand the nature of it, which, according to the experts, makes it necessary to be able to make out details of the order of 1 meter in size on the ground...

"This may not be the kind of resolution which the Pentagon satellites have, but it will be possible to clearly distinguish a tank from a truck and probably to recognize what make it is," the engineers confirmed and they also stressed that it is already possible for such an objective to be achieved. A prototype camera has been constructed in Aerospatiale's Cannes factory. And tests at simulated altitudes have apparently been completely satisfactory.

In the technical sphere, Helios will be broadly based on the systems developed for Spot, which, from its altitude of 830 km in orbit, officially makes it possible to make out details 10 meters in size on the ground, but which, it seems, actually does much better: Nobody wants to shout about it for reasons of high-level diplomacy toward some countries which are overflown, but this satellite can apparently easily make out objects around 5 meters in size.

Physically the Helios satellites will be very similar to those in the Spot family, and will use the same platform manufactured by Matra. Jean-Luc Lagardere's firm will thus be involved in this important military program, being responsible for the structure of the satellites which it will also assemble--integrate--in its Toulouse factories.

It was announced in Estoril that Helios would use much of the same equipment as Spot, especially the high-speed on-board recorder which has just been developed in France (models 3 and 4 of the Spot satellite will be equipped with it) to enable it to do without a machine hitherto exclusively manufactured in the United States. Similarly Aerospatiale confirmed that, like our civilian observation satellite, the Helios family satellites will be "video spies": Instead of taking photographs on film, they will be equipped with silicon-based receptors which will turn the light waves picked up by their cameras into electrical impulses. The latter will be stored on the on-board recorder, then transmitted to computerized processing stations on the ground, where the computers will turn them into pictures. This electronic part of the program, also as in the industrial organization set up for Spot, will be carried out by the European Propulsion Company--the firm which produces the Ariane motors and the strategic missile motors.

Repairs

Such a system of electronic vision, the engineers admitted, will not produce the accurate details obtained with satellites like those of the American and Soviets, which eject capsules containing reels of film. In the United States it is apparently now possible to make out objects which are between 20 and 30 cm, while in the USSR the "performance" in this sphere is apparently around 50 cm...

On the other hand, Aerospatiale stressed, limiting ourselves to video observation will have a great economic advantage. Whereas satellite equipped with a photographic system have to orbit at an altitude of less than 200 km to take the most accurate pictures, which limits their life to a few months, the Helios satellites will orbit several hundred kilometers from the ground, around 400 km, it seems. This will make it possible to use them for around 3 years initially.

Henri Martre thinks that the life of our satellite could be greatly extended at a later date, thanks to our future Hermes shuttle, because some of its missions will be to go and refuel them or change their worn-out batteries.

In fact video spy satellites will not be exclusively French: The Americans have put into service a series of satellites called "KH11" which function in two ways: They carry out video observations in quiet periods, at an altitude of several hundred kilometers. In case of tension or of a major event in one area of the world, they "dive" to much lower altitudes to take extremely accurate photographs. But that is a kind of suicide which considerably reduces their life...

The Aerospatiale engineers have estimated that it will take them around 5 years' work with their various partners to produce the defense ministry observation system which will probably have performances close to the video part of the KH11. But they admitted that some technical aspects of this program are a kind of challenge. This is particularly true of the development of the camera adjustment system which the satellites will have. If this camera is to have the planned resolution in all circumstances it must be possible to adjust the focal length of its lens from the ground with an accuracy of around 1 micron.

/9738

CSO: 3698/496

WEST EUROPE/FACTORY AUTOMATION

MILAN POLYTECHNIC DEVELOPS NEW ROBOT SENSOR TECHNIQUE

Milan TECNICHE DELL'AUTOMAZIONE & ROBOTICA in Italian Mar 86 pp 62-67

[Article by Alberto Borghini and Piero Fasola, senior students of Electronics Engineering at Milan Polytechnic, and Engineer R. Simino, head of sensor research for applications to industrial robotics and artificial intelligence at Milan Polytechnic: "Robot Becomes Expert in Choosing Scanning Frequency"]

[Text] An intelligent ultrasonic distance-gauge under development at Milan Polytechnic is capable of choosing the optimal ultrasonic scanning frequency as a function of the target object's characteristics. The system is applied to an articulated robot equipped with bidimensional vision to determine the distance from the object to be manipulated, thus realizing a 2.5-dimensional system.

Analyzing the development of industrial robotics, one quickly finds that it has attained noteworthy levels only in the sectors in which products are mass-produced in sizable quantities per run. This type of production, precisely owing to its monotonous repetitiveness, has characterized the development of the industry in recent years. Industrial automation has not only contributed to the development of several medium- and large-sized industries, but has been one of the predominant factors in the crises besetting others--namely, those industries that are unable to afford major technical renovations, and those whose development plans did not provide for suitable automation of their productive processes.

The word "automation" has now entered high-handedly into our language, sometimes as an incorrect synonym for flexibility, and it is by no means difficult to predict its growth in the various sectors. The high cost of these devices, however, places a drag on their development, and makes of them a technical resource that not everyone can afford.

In the sphere of automation it is impossible to avoid talking in terms of robotics and in particular of the developmental progress that has been made in one of its sectors: Sensor technology. And it is this sector with which we have concerned ourselves and in which we have developed and considerably diversified a vision system conceived at Milan Polytechnic (LINCE)^(1,2).

The industrial robot is still found to be hardly versatile because of its meager sensing capabilities. This is the basic reason why robots are being applied mainly in large-scale mass-production industries--industries, that is, devoid of sudden structural changes⁽³⁾.

It seems clear, therefore, that equipping a robot with vision is a very important step towards total flexibility and independence of the machine. There will be no further need for those external mechanical devices designed to present the target object in pre-planned positions and locations. This means equipping the machine itself with a system that will also enable it to deal with situations that have not been pre-planned, thus avoiding unwanted stoppages in the production line in which it is installed. It will enable the use of ordinary conveyor belts or pallets; that is, belts or pallets not specifically designed to handle the particular item in the production chain⁽⁴⁾.

Equipping the robot with vision enables a drastic reduction in the need for dedicated sensing facilities; furthermore, the robot can then be made to handle a greater diversity of objects than would not otherwise be easily feasible without a vision system⁽⁵⁾.

Reducing the sensing facilities means greatly reducing costs: Suffice it to consider that these facilities sometimes increase the cost of the robot by a factor of five. The cost increases for application of a vision system are more than compensated for by the savings on other sensing components and by the use of a standardized environment.

The most important of the goals sought in designs dedicated to artificial intelligence is that of equipping the robot with decisional capability based on its own acquired experience, thus endowing the machine with a capacity for self-determination in the execution of specified choices^(6,7).

Only thus is it possible to apply robots in those industries as well in which mass-production is not on a large scale and the required manipulation extends over a broad range of pieces diverse pieces.

AUREO System

This system, still in the process of being mounted on the PUMA articulated robot⁽⁸⁾, has as its principal characteristic the use of an ultrasonic sensor for the gauging of distances between the robot's gripper and the target object.

The ultrasonic sensor has the undeniable advantage of the economy and simplicity of its mechanical mounting as compared with other distance-measuring systems; the fact is that its electroacoustic transducer weighs only a few grams and is very small in size. Figure 1 [not reproduced here] illustrates the mounting of the sensor on the robot's gripper. Based

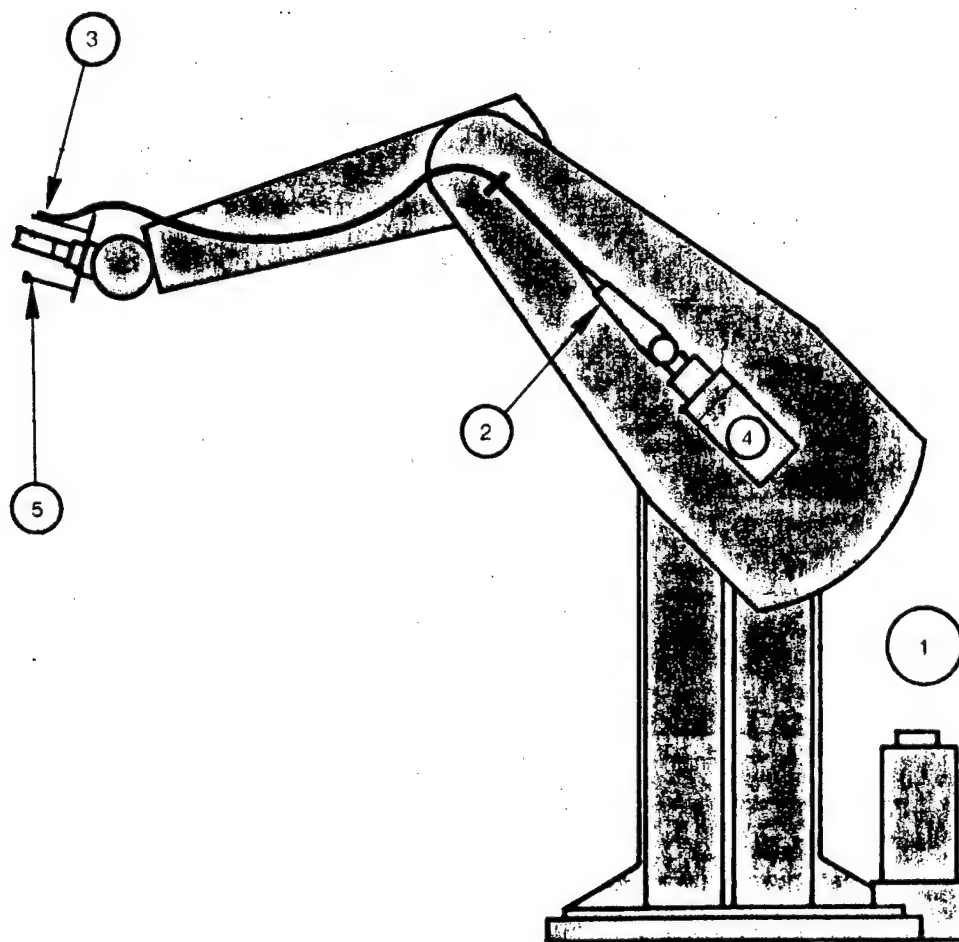


Fig 2 - LINCE Inspection System.

Key:

1. Unimation PUMA Robot.
2. Olympus 1F8D3/1500 Fibroscope.
3. Fibroscope lens.
4. General Electric TN2200 camera.
5. Ultrasonic sensor.

on using an already-existing system, the application is not among the most rational; however, a more up-to-date system design is presently under study that enhances the capacity of the sensor.

Design work on these capabilities is now at an advanced stage such as to permit reliable applications in many sectors. An integrated inspection system incorporating an ultrasonic distance-gauge, the LINCE system, was designed at Milan Polytechnic and exhibited at the SIRI congress by its designer^(1,2).

The system uses a single TV camera; hence, the visual information gathered is bidimensional, lacking the notion of depth. To partially overcome this deficiency, the machine has been equipped with an ultrasonic distance sensor, thus obtaining a 2.5-dimensional vision system. The LINCE inspection system is described in Fig 2.

For this application, frequencies between 20 kHz and 100 kHz are sent to the sensor^(9,10). In this band, the ultrasonic signals are reflected by obstacles in relation to several parameters characteristic of the object struck by the beam. Important parameters from the standpoint of reflection are, for example, the material, the wavelength of the signals in relation to the dimensions of the object, the angular relation of the surface struck with respect to the angle of incidence of the beam, or the surface texture⁽¹¹⁾.

Assuming a surface of infinite size, struck by the beam perpendicularly with respect to its axis of propagation, the acoustic impedance (R), the parameter that determines the quantity of reflection, is defined. This quantity is given by the product of the density of the obstacle and the velocity of propagation of the signal.

The amplitude of the reflected wave as a function of the incident wave is given by:

$$A_r = \frac{R_1 - R_2}{R_1 + R_2} A_i$$

where:

A_i = incident wave

$R_1 = \rho_1 c_1$

$R_2 = \rho_2 c_2$

ρ = density of the material.

c = velocity of propagation of the material

This gives the total reflection in the case in which the wave is propagated in air, without taking into account the aforementioned parameters on

which the ultrasonic signals depend, and in which the surface is infinite with respect to the wavelength: In this case, the reflection is specular. If, instead, the surface presents irregularities exceeding 1/20th of the wavelength, the reflection takes place along infinite directrices, including the incident one.

By means of laboratory tests, appropriate wavelengths can be established for each object examined. That is, by analyzing the initial parameters for each object to be manipulated, the optimal frequency providing the maximum reflection can be determined.

These considerations comprise the genesis of our project, based on a search for these frequencies by the robot, with the robot able to send variable-frequency ultrasonic waves to the target object, and to analyze their echoes, studying their fundamental characteristics and selecting the best one from among them.

The criteria for the selection of the scanning frequency, on the basis of its associated echo, are the following:

--The system must be able to recognize a situation in which the target object is present but returns no echo.

In this regard, two distinct cases can obtain:

1. The target object is present but no echo is received;
2. The target object is present and an echo is received.

The first case, which is the simplest to deal with, obtains when the frequency being used does not match either that of the object nor that of the surface on which it is resting. The work zone is then scanned, using samples of diverse frequencies, and considering as factors in the choice of the optimal signal:

a. The shortest time elapsed between transmission of the wave and reception of the first echo;

b. The echo of maximum amplitude.

Factor a undoubtedly takes precedence over factor b, since the receipt of an echo does not mean that it pertains to the target object; it may pertain, and with a higher degree of probability, to the surface on which the target object rests. If the obstacle is a solid of practically infinite size, positioned perpendicularly to the axis of emission, the percentage of the wave reflected, for any frequency, is found to be 100 percent. From this we deduce the foregoing statements, since the plane of the work table can be considered infinite with respect to the wavelength of the ultrasonic signals.

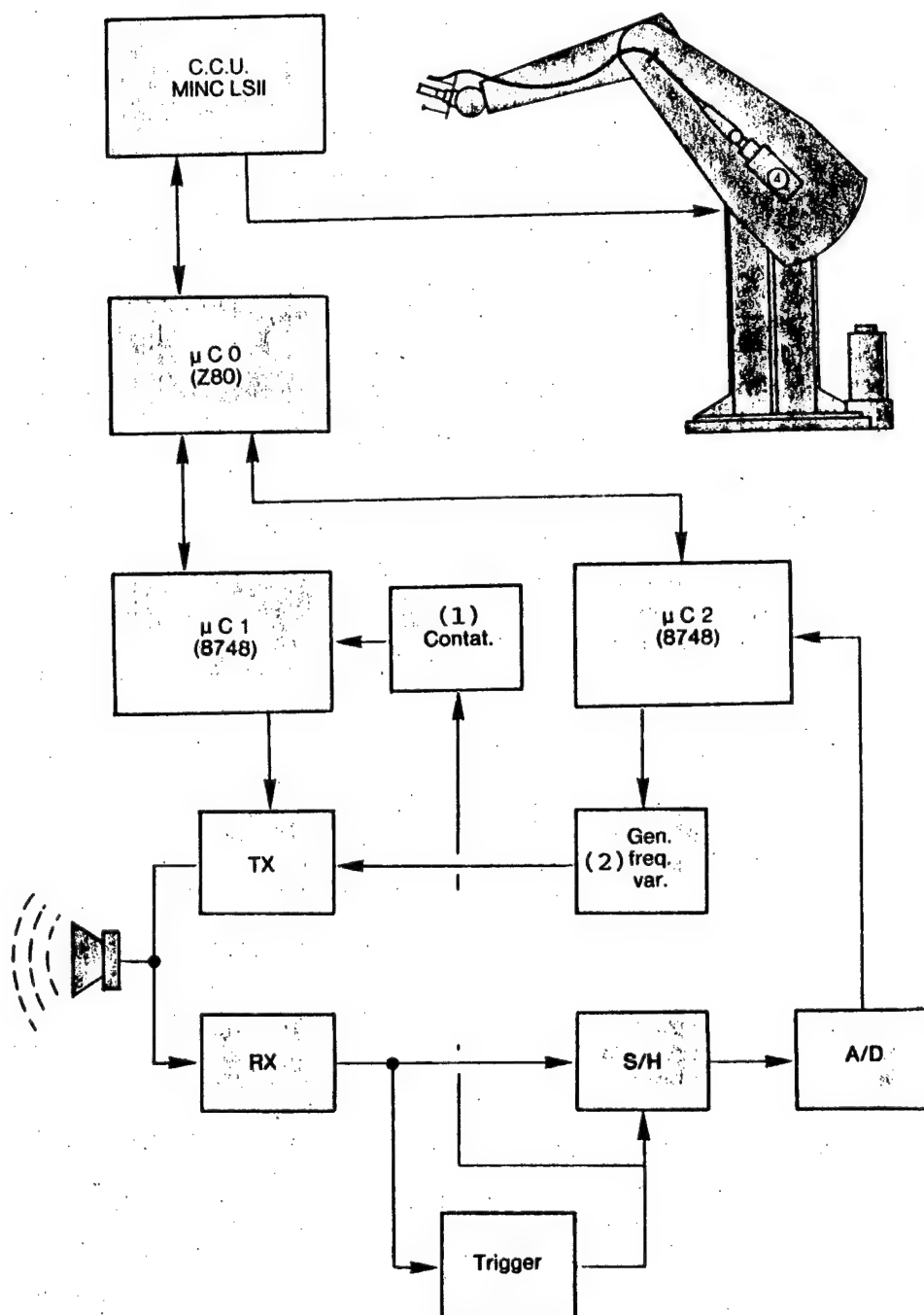


Fig 3 - Block diagram of AUREO system.

Key:

1. Counter.

2. Variable frequency generator.

Factor *b*, which can be related in part to case *a*, can appear to indicate that the system is operating normally; however, for the aforementioned reasons, there can be no complete certainty of this, unless the object "seen" is the same as the one manipulated in the preceding operation.

The system must therefore, at the start of an operation, proceed to a complete sweep of the scanning frequencies, then select the most suitable one to use. This procedure must be repeated each and every time the object under examination is different from the previous one.

The system must be optimized. This means that it must avoid repeating inspection operations that may be superfluous, so as to reduce the robot's manipulating and computing times. To this end, the system must possess an integrated memory in which it records the characteristics of previously manipulated objects.

Hardware Structure

This system is built around a multiple-microcomputer structure interconnected hierarchically in a three-level configuration, as shown in Figure 3^(12,13).

The highest level is controlled by an MINC (Digital) computer which implements the robotics laboratory's control programs.

A microprocessor (Micro 0), powerful enough to support the control algorithms of the ultrasonic transceiver and frequency changer, is inserted at the intermediate level, so as to decentralize the decision-making as much as possible. A widely-available, hence low-cost microprocessor, the Z80 (Zilog), was chosen for this purpose. By using this structural configuration, control of the frequency changer is made independent of the MINC computer.

At the lowest level, there are two (Intel) 8748 single-chip microprocessors (Micro 1 and Micro 2)⁽¹⁴⁾. They operate as an intelligent interface between Micro 0 and the outside world, performing a preprocessing of the data.

Micro 1 furnishes the enabling signal to the transducer for the emission of the frequency and determines the duration of the emission. Thus, by varying the microcomputer's algorithm, the packet length of the transmitted waves can be varied. For the time being, this duration has been fixed at 100 μ s, thus enabling the locating of objects situated at only a few centimeters distant from the transducer.

The resolution is dependent on the rise time of the first echo received and in any case does not exceed 1 to 2 mm.

Upon receipt of a measurement request from Micro 0, Micro 1 enables the transmission of a burst by the sonar, and simultaneously enables counting to be done by several counters whose operation will be stopped by the first echo received. The content of the counters will be memorized by the microcomputer. This procedure is executed four times, after which the measurements thus obtained are averaged.

Micro 2's function is to pilot the programmable frequency generator (designed around programmable counters), and to acquire the amplitude of the echo prior to digitization. As in the case of Micro 1, Micro 2 averages the amplitudes in each group of four echoes and evaluates the variance; it then sends them to Micro 0 which processes them.

A structure such as this, which at first glance might seem redundant, was chosen both for its modularity and for ease of expansion of the system. In fact, as is easily seen, other microcomputers can be connected in parallel with the two 8748's for possible future expansions, without in any way impairing the operation of the system as a whole.

Microprocessors' Control Algorithms

Three principal algorithms were developed for implementation in Micro 0 to manage the ultrasonic sensor:

1. The first algorithm diagrammed in Figures 4 and 5, is designed for use in the learning phase; otherwise it will be used when the robot must manipulate an object that has not yet been examined.

The system must find the most suitable frequency for the ultrasonic distance detector. The execution of the algorithm starts when Micro 0 receives the label (an alphanumeric character, for example) of the target object (which label will be unknown to it, of course). Micro 0's first step will be to start the sweep of the entire spectrum involved (20-100 kHz), beginning with the lowest frequency and proceeding in increments of 5 kHz.

For each frequency, Micro 1 executes four distance measurements, then averages them, calculates the variance, and communicates them to the microprocessor at the highest level. Concurrently, Micro 2 measures the amplitude of the echo, averages it, and evaluates the dispersion. The dispersions are evaluated as a ratio of a threshold, so as to decide whether the measurements are reliable; if they are found not to be, the measurements are repeated. If the situation does not improve in this respect, the frequency is definitively abandoned. Should the measurement be considered reliable, it is compared with the measurement pair that has been deemed the best for the frequencies scanned up to that point. A pair of measurements is deemed better than another pair if: a) the distance term is independently less than the amplitude term; or b) for equal distance

Key to Fig 4:

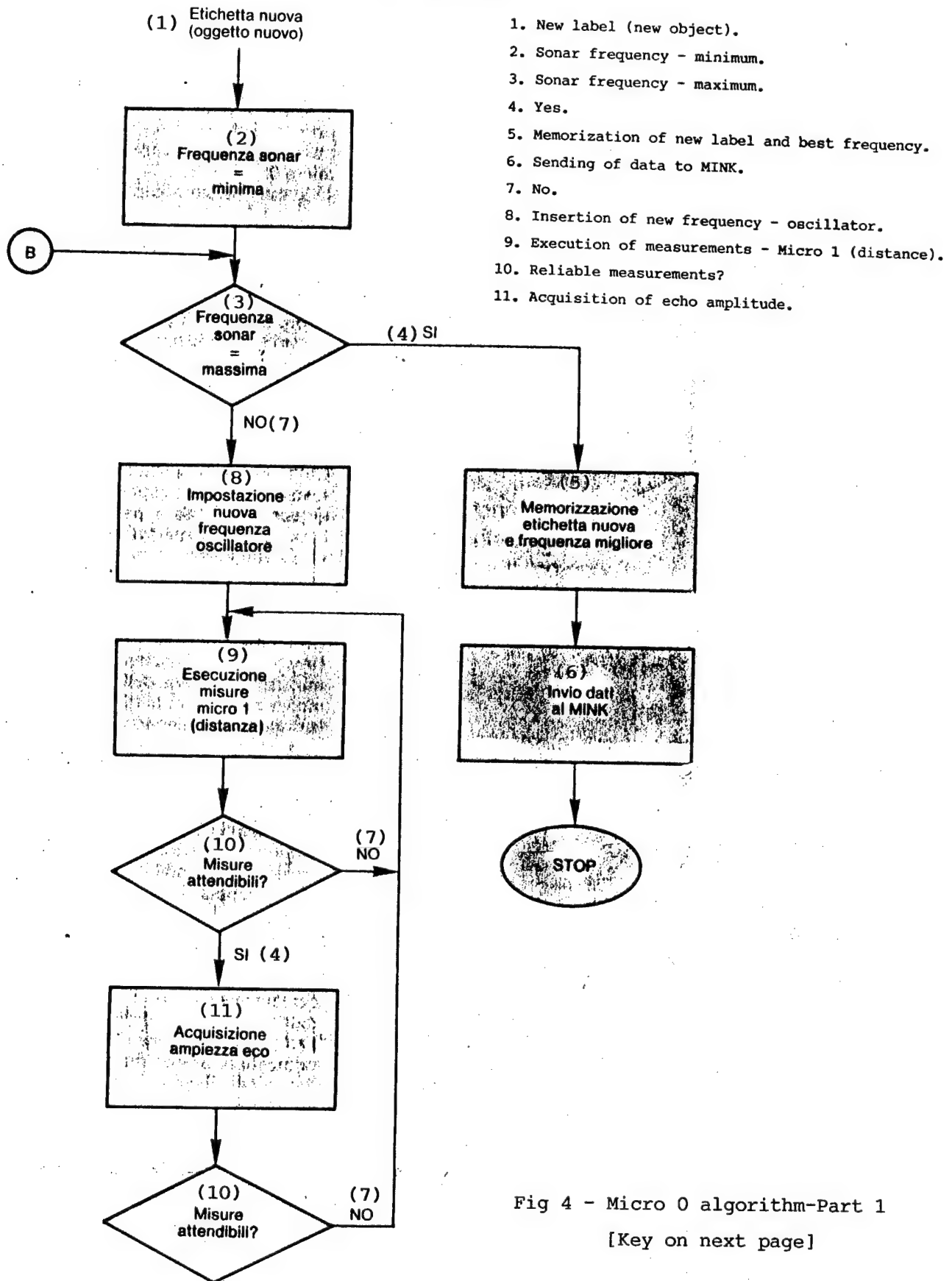
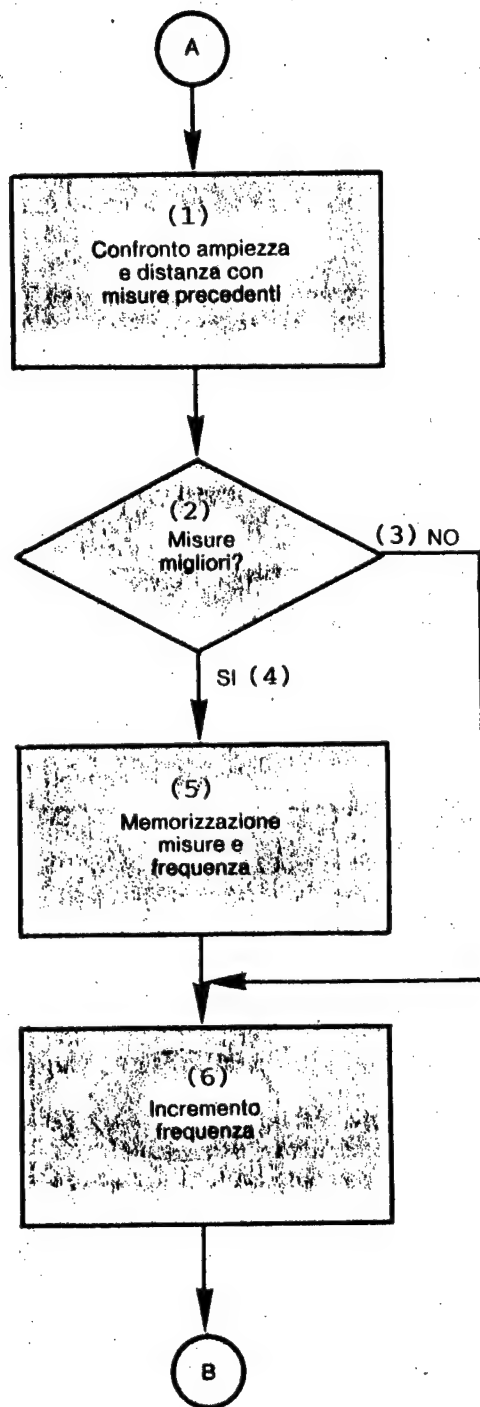


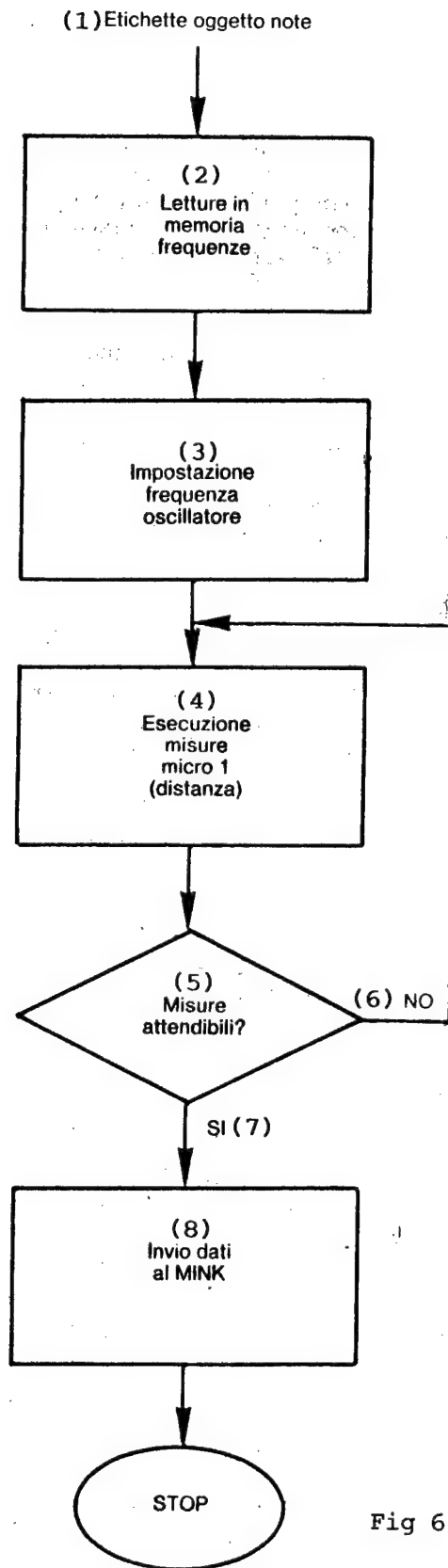
Fig 4 - Micro 0 algorithm-Part 1
 [Key on next page]



Key:

1. Comparison of amplitude and distance with previous readings.
2. Better readings?
3. No.
4. Yes.
5. Memorization of measurements and frequency.
6. Frequency increment.

Fig 5 - Micro 0 algorithm-Part 2.



Key:

1. Object labels known.
2. Readings in frequency memory.
3. Insertion of frequency - oscillator.
4. Execution of measurements - Micro 1 (distance).
5. Reliable measurements?
6. No.
7. Yes.
8. Sending of data to MINK.

Fig 6 - Micro 0 algorithm, used during robot's normal work cycles.

measurements, the amplitude of the echo is greater. Of course, the measurements will be subject to uncertainty, which must be taken into account when comparisons must be made between two measurements. In fact, measurements made at different times will, within a certain degree of probability, differ numerically. Upon completion of the scanning, the frequency found to be the best will be memorized together with the label of the object examined.

Owing to the architecture of the microprocessors used, the execution time cannot result excessive; in any case, however, it should be borne in mind that this algorithm will be executed during only one startup phase, and not throughout the operating life of the robot.

2. The second algorithm, diagrammed in Figure 6, will be used during the normal work of the robot. It is executed when it is known that the object in the working field of the robot is part of a family of objects that has already been previously examined with the type 1 algorithm.

In fact, during normal work, it will manipulate only a limited number of objects. This second algorithm is formally the same as the first, except that the search for the optimal frequency will be made not among all possible ones but rather only among those that are characteristic of the objects belonging to the family that is to be manipulated. Since these frequencies will be limited in number, the search time will be limited as compared with that of a blind-type search.

3. And lastly, consideration is given to the possibility that the robot already knows the target object (typically, identified by the vision system or priorly known to the robot). In this case, the MINC will communicate the label of the object, or the optimal frequency. In the first of the latter alternatives, Micro 0 will search its memory for the ultrasonic frequency (of course, the object must already have been examined).

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WEST EUROPE/LASERS, SENSORS, AND OPTICS

MBB'S TACTICAL AIR DEFENSE LASER TAKES 15 YEARS TO DEVELOP

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German
6 May 86 p 5

[Unattributed article: "High Energy Laser for Tactical Air Defense--Titanium Sheets One Centimeter Thick Penetrated in Barely One Second"]

[Text] Frankfurt. Low-flying missiles offer an attacker an ever increasing chance to deliver an unexpected "first strike," in order to eliminate important defense facilities of the enemy and to resort to military conflict at an early stage in favor of the attacker's own superiority. In the future, however, the employment of "forward looking sensors" must be reckoned with, which will make autonomous target searches and target engagement possible also for unmanned missiles. Since the early 1970's, work has been going on at MBB [Messerschmitt-Boelkow-Blohm] on the development of high energy laser systems. The central component of this system is a laser with an average beam power of several megawatts. This power is two to three magnitudes higher than that of the most powerful laser currently being employed in the metal-working industry. With it one can penetrate titanium sheets 1 cm thick in less than 1 second.

Already at an early stage the decision was made in the FRG to examine the gas-dynamic carbon dioxide laser. Its "fuel" is inexpensive: ordinary hydrogen, which is burned together with a nitrogen-containing oxidizer. Both can be carried in liquid tanks. The combustion provides the required laser energy. The hot gas flows through a comb of very small Laval nozzles, whereby it expands very quickly and is put into an "inversion state," as is necessary for light amplification (the laser effect per se). The gas then flows at supersonic speed through an optical resonator, where stimulated (excited) emission and tuning of the laser radiation take place. Thereafter the expended non-toxic gas mixture is ejected into the atmosphere by means of a diffusor.

The wave length of the laser radiation in the infrared region of the light spectrum is in this case around 10 micrometers. It is a compromise between good focusability and favorable atmospheric transmission. All things considered, a relatively simple technology, requiring neither a power generator nor a gas pump. In place of elaborate cooling equipment, the expended gas also carries off the heat resulting from the energy losses. The consumption of fuel per "laser shot" is roughly equivalent to the weight of a guided missile. Just as important as the laser generator are the optics utilized, which are supposed

to tune the high energy beam out of the laser gas, focus it on a target and hold it on the spot being sighted in. So as to produce as high an energy concentration on the focal spot as possible, a concave mirror with a diameter of more than 1 m is used as the "transmitter." Only in this way can effects such as diffraction expansion as well as absorption and refraction of the laser beam in the atmosphere be adequately compensated for. Various solutions were worked out in Western industrial nations for the completely new problem of holding a focused laser beam on a specific spot of a large-area target for a specific length of time and with extreme accuracy.

In all [these solutions], the high energy beam itself is used as a sensor element in a closed control loop. Procedures tested to date rely on the utilization of reflection differences at the target or on differential processes in which the deviation of the laser beam center from target marks, such as can be provided by various imaging sensors, is used as the control signal. With a high energy laser system, extremely small aiming and engagement times are allowed for. In addition, lead angles and similar factors do not apply. For that reason, a passive target locating system can be used in place of radar. And, finally, the planned coverage of the entire hemispherical airspace above the system permits numerous targets to be tracked simultaneously.

This is the precondition if the laser is to be employable for continuing engagements with no time delay. A laser power of several megawatts suffices for a radiation of 1 second duration, so as to penetrate the framework of an airborne object up to 10 km away. This short time should suffice to hinder several objects almost simultaneously from continuing their flight, through damage to their sensors, for example. But in the opinion of the experts it will take another 15 years before the high energy target laser weapons system can be called ready for series production.

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CSO: 3698/467

WEST EUROPE/MICROELECTRONICS

BRIEFS

PHILIPS, SIEMENS MEGACHIPS ON SCHEDULE---Amsterdam, March 11--The Dutch Philips electronics group and its West German partner Siemens plan to show the market their first samples of new 1 and 4 megabit chips around September 1988, executive board member G. van Houten said today. Speaking at the opening of a micro-electronics congress, Fiarex, here he said the joint Philips-Siemens Megachip project was well on schedule when compared with developments elsewhere in the world. The joint venture, into which Philips and Siemens are ploughing 1.5 billion guilders in five years and to which the Dutch and German governments are contributing 500 million guilders each, is one of the methods used to stimulate the European electronics industry. Van Houten said the super memory chips of Philips and Siemens would be marketed in large numbers in 1989. Philips attracted 150 highly qualified workers last year. They will be joined by an additional 100 this year, to be recruited in the Netherlands, the U.S., Britain, Ireland and Taiwan, Van Houten said. He denied that Philips was lagging behind megachip developments elsewhere in the world. Press reports today said the West German government was putting pressure on Siemens because of fears it would arrive too late on the market with its megachip following recent announcements by U.S. Texas Instruments and the Japanese Toshiba and NEC that their megachips are ready now. Under the joint venture Siemens is concentrating on a dynamic chip of 4 megabits and Philips on a static chip of one megabit. [Text] [The Hague ANP NEWS BULLETIN in English 11 Mar 86 p 5] /8309

CSO: 3698/498

WEST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

BRIEFS

FIRST NORDIC TECHNOLOGY PARK EXPANDS--The activities of the first Scandinavian technology park, in operation 4 years now, are advancing. On Tuesday the Oulu Technology Park opened its first company building near the university grounds at Linnanmaa. By the end of the year a total of 4,000 square meters of company facilities will be completed in the area, at which time the technology park will have a total of nearly 10,000 square meters of company facilities. About 70 companies will be in operation in them and the total number of workers will have risen to over 300. "In moving to Linnanmaa, the park offers us unprecedented conditions for the high-tech industry," general manager Pertti Huuskonen said. The Mobira Oy team, which is to plan radiophone programs, Noptel Ky and Prometrics Oy, specializing in optical electronics, and Outel Oy, specializing in data transmission equipment and robot phones, have now moved into their own buildings. At the present time 44 companies are in operation in the technology park and there are about 250 workers in them. Different kinds of adapters of electronic and automatic data processing equipment and high-tech support services are among the companies' most important fields of activity. The inauguration ceremony for Tietomaa Oy's first phase, which company is part of the Oulu Technology Park, was also held on Tuesday. Tietomaa was founded last summer as an information technology training, exhibition and hobby center. [Text] [Helsinki UUSI SUOMI in Finnish 17 Apr 86 p 14] 11466

CSO: 3698/0452

WEST EUROPE/TECHNOLOGY TRANSFER

HIGH TECHNOLOGY IN FINLAND: COMPUTERS, CONTROLS, EMBARGOES

Left Views Digital Role

Helsinki TIEDONANTAJA in Finnish 18 Apr 86 p 6

[Article by Svante Ahlroth and Jorma Hall: "Big Brother Is Watching: Direct Access from Digital Headquarters to Every Computer"]

[Text] The Digital Equipment Corporation (DEC) can have direct access to every computer in Finnish Government offices it has sold the government from the DEC service center in Valbonne in Southern France. While from Valbonne there is a direct line to Digital headquarters in the United States.

By means of this so-called remote diagnostic connection, they can obtain knowledge of Finland's special circumstances dispatches, among others, any time they like from DEC centers.

During the past 2 years the DEC has sold Finnish Government agencies computers and programs worth 12 million markkas. Among others, every provincial tax office is getting a DEC computer.

TIEDONANTAJA has already reported, in its editions of last Friday and Wednesday, what the consequences of procuring DEC equipment have been for government agencies and for individual government officials. Officials who use Digital computers have to sign an agreement in accordance with which they will comply with U.S. export laws. As orderers of the equipment, government offices are responsible for complying with the agreement.

Access Twice a Month

According to information TIEDONANTAJA is in possession of, twice a month they have access to every DEC computer from the Valbonne service center, including those in Finnish Government offices. This practice involves most of the computers in use in government administration, those that come under the full-service agreement concluded by the State Computer Center with Digital.

At the time of the maintenance communication, so-called diagnostic runs are conducted and any errors produced by these are reported to Digital in Finland. Any repairs are then taken care of through the company's local organization.

Provincial government computers among other things hold all the data on special circumstances, which include records of personnel placements and of persons still in part working as well as data on equipment and space reservation. By means of remote diagnosis, it is possible for them to monitor these data from France without the provincial governments' -- to say nothing of our top government agencies' -- knowing anything about it.

It is stated in the conditions of the agreement with the equipment supplier that the equipment supplier may not use the data for his own purposes. It has not, however, been investigated how binding such purely commercial agreements are since what is involved are public administration data.

Data Are Not Protected

Diagnostic access operates directly with data on operational systems, recruiting and other programs that are in the computer's memory banks. It is technically possible to protect certain data that are physically located in the same memory bank.

However, data that are in the government agencies' DEC computers are not protected. Among others, the fact that the computers do not contain any data that might be secret and that it takes so much work to build protection into the system is used to justify this in connection with the development of programs.

This direct access ability can, of course, also be excluded externally if so desired. But according to the data we have examined, in practice this is not done based on the fact that the computers do not contain any secret data and because access is among the agreed-on maintenance services.

The legality of the obligation imposed by the United States, the agreements that were revealed earlier and remote diagnosis has not been publicly discussed in Finland.

Critical Information Is Exposed

The position assumed by the head of the State Computer Center (VTKK) is characteristic of their attitude toward the handling of security risks. In discussing the matter, the head of the VTKK expressed the opinion that [these] matters are so sensitive that we would have to return to them later. This did not, however, happen.

There are data in the computers of the provincial governments on the economy and the state's share of it and on matters pertaining to municipal and local licensing as well as data on special circumstances.

This year too, the Central Hospital districts have purchased their own data on municipalities and parishes from the population registry and they are now handling them by province with Digital VAX computers.

Communications between provinces are handled via the VTKK's national trunk line. The VTKK network is now IBM-based and lines between VTKK computers and provincial government computers are protected. The VTKK is renewing its equipment and the object of the renewal is to achieve better voice communication with the provinces and the VTKK's central records. The Finance Ministry Organizing Department's Automatic Data Processing Office is responsible for the security of public administration automatic data processing systems. It looks after computer readiness planning and security as well as drafting regulations pertaining to these matters.

There is also a department responsible for these matters under the jurisdiction of the Defense Economy Board.

The Interior Ministry is responsible for improving provincial government data control.

Report on Embargo Seminar

Helsinki TIEDONANTAJA in Finnish 16 Apr 86 p 5

[Article by Svante Ahlroth and Jorma Hall: "Embargo Experts Meet: American Export Embargo Consultants at a Secret Seminar in Helsinki"]

[Text] Finnish Government officials' obligation to comply with U.S. export regulations in dealing with American-based information technology was raised for discussion on Tuesday at a top-level seminar in Helsinki.

U.S. experts, who briefly outlined the topic at the seminar, stressed the fact that the law governing the exporting of U.S. information technology is applicable to Finnish Government officials in the same ways it applies to private Finnish firms.

Instruction on the latest applications of the U.S. export embargo regulations is being given in a 2-day course at the Inter-Continental Hotel in Helsinki.

U.S. embargo experts have been outlining the subject at this seminar intended for Finnish firms which has been held today and yesterday.

The consulting firm of Rastor, owned by Nokia, Tampella and Partek among other large Finnish firms, is the official organizer of this seminar held behind the closed doors of the Consul Room in the Hotel Inter-Continental.

About 30 information technology experts from Finnish firms are participating in the seminar. Representatives of government agencies are not participating in the seminar. Participants have to pay about 2,000 markkas for the 2-day seminar.

American Experts

The latest information on restrictions on U.S. high-tech exports in Finland's trade with the East Bloc is being disseminated by William Brandt, who heads

a big consulting agency in Washington that specializes in export embargoes, Larry Christensen, a Washington lawyer who is familiar with the export embargo law, and Dr A.F. Kracklauer of the U.S. Embassy in Helsinki.

Got Them to Talk About TIEDONANTAJA Story

The 16-hour seminar has been closed to the press but, according to reports, as early as the first day at it they discussed TIEDONANTAJA's article of last Friday in which TIEDONANTAJA reported on Finnish Government officials' obligation to comply with the U.S. export law when dealing with American-based high-tech products.

According to TIEDONANTAJA's source, when the case was discussed at the seminar, the U.S. briefers very clearly emphasized that the law governing the exporting of U.S. information technology is binding for Finnish Government officials too.

"Finnish law applies aboard a Finnish ship, even if it is in Singapore. U.S. law applies in matters pertaining to U.S. information technology, even if it is in use by a Finnish Government agency," the Washington experts declared.

Big Contracts Celebrated at Digital

This year Finnish Government agencies concluded contracts worth 8 million markkas with the U.S. computer giant, DEC. The VTKK and Nokia arranged for the purchases.

Last year government agencies bought 4 million markkas worth of computers and programs from DEC. The doubling of cooperation between the U.S. multinational computer firm and Finnish Government agencies was celebrated last Thursday in the offices of DEC. Among others, the representatives of DEC and the Finnish Government who negotiated and concluded the contracts were present.

In the opinion of DEC's own people, "the public administration has dropped into our laps." Thanks to its very small but effective and easy-to-use VAX computer, DEC has succeeded in concluding big contracts with Finnish Government agencies, overtaking the IBM and Nixdorf computers, which were in the lead before and are still the commonest computers in parish and municipality offices.

Government agency computer procurements are generally handled through the VTKK. In many cases it is already stipulated in the Council of State decision with whom the government agency will conclude a contract for the procurement of computer equipment.

Although the VTKK serves as a buffer between them, the user must, despite the fact that it is a government agency, give its pledge to the U.S. Foreign Trade Department's Export Administration Office.

If an official fails to sign or violates an agreement based on U.S. export regulations, it may lead to his losing his job or being transferred.

Violation of U.S. export regulations means big problems for a government agency that procures or arranges for the procurement of computer equipment from DEC or any other U.S. firm. In conformity with the U.S. export law, such agencies will in future be denied the opportunity to procure and use information technology of U.S. origin.

Furthermore, in connection with the procurement of any computers, a licensing agreement is signed between the seller and the buyer. According to this agreement, "DEC pledges itself to comply with U.S. export regulations, which the orderer, the recipient of the products and their users also pledge themselves to comply with, this being the way things are."

Therefore, it is emphasized in the licensing agreement that representatives of the Finnish Government have signed that, "relying on these rules, DEC products and technical information may be supplied only to those customers who fulfill the conditions stipulated by the U.S. Department of Commerce or who have a valid export license granted by it." According to the licensing agreement, a customer pledges himself to provide DEC with information on the destination of the products.

It is the responsibility of the orderer to also inform his subsidiaries of these regulations "and also to confirm this by requesting that he and the subsidiaries in question sign the above agreement."

In connection with the courses, the agreements specifically refer to courses given by DEC for provincial government officials, for example. Otherwise, matters are handled through the VTKK and DEC imposes obligations on it.

The legality of U.S.-imposed obligations having to do with the security of agreements and other arrangements has not been publicly discussed.

Government Asked for Its Position

TIEDONANTAJA's article last Friday on government officials' obligations has led to a parliamentary interpellation.

Member of Parliament Ensio Laine (Communist) has asked the government what steps it intends to take as a result of the fact that we have begun to impose the acceptance of and compliance with export embargo regulations involving technical data enacted by the U.S. Government as a condition for Finnish Government officials' participation in training programs in the field of computers which are taking place in Finland and for their keeping their jobs.

DEC Export Regulations

DEC pledges itself to comply with U.S. export regulations, which the orderer, the recipient of the products and their users also pledge themselves to comply with, this being the way things are. Relying on these rules, DEC products and technical information may be supplied only to those customers who fulfill the conditions stipulated by the U.S. Department of Commerce or who have a valid export license granted by it. The customer pledges himself to provide DEC with information on the destination of the products.

The orderer and his subsidiaries may not export or pass on technical data obtained from DEC or products containing them to the following countries: Afghanistan, Albania, Bulgaria, Cuba, Czechoslovakia, Estonia, the German Democratic Republic (also East Berlin), Hungary, Kampuchea, Laos, Latvia, Libya, the Mongolian People's Republic, North Korea, the People's Republic of China (with the exception of Taiwan), Poland, Romania, the Soviet Union, Vietnam and the police or military communities of South Africa and Namibia as well as the Atomic Energy Council of South Africa without the written permission of the U.S. Department of Commerce's Export Administration Office insofar as ordinances or export regulations so specify.

DEC provides a document like this for Finnish Government representatives, among others, to sign.

Pressured for Compliance Agreement

Helsinki SUOMEN KUVALEHTI in Finnish 25 Apr 86 p 12

[Text] The United States' European allies plan to pressure Finland to link itself more closely than now with the high-tech export embargo restricting trade with the East Bloc. According to reports published in Sweden, Washington wants Finland to be the next country to conclude an export embargo agreement, as neutral Austria, Switzerland and Sweden have done.

Reports on American intentions have been published in the professional journal NY TEKNIK, which bases its news on a highly-placed source in the U.S. State Department. According to the unnamed source, the United States does not intend to openly promote the matter; rather it plans to use the governments of the countries allied with it to help it.

The West wants to keep the Soviet Union from getting its hands on militarily useful high-tech products by means of the embargo on exports. To achieve this objective, the industrial countries of the West impose as a condition that the high-tech products sold by them under no circumstances be reexported to the socialist countries.

Finns have complied with the export regulations to the letter of the law. We are compelled to do so since our industry is still very dependent on Western technology. In Finland's opinion, new agreements are unnecessary since the embargo is in any event being maintained.

According to NY TEKNIK, the Americans want to link Finland closely with the export embargo among other reasons because our extensive trade with the East Bloc is at present in serious difficulties as concerns our exports. The United States fears that the temptation [to reexport high-tech products] may grow as sales curves slump.... Furthermore, the Americans seem to be concerned over whether Finns will be able to refrain from exporting their own high-tech products to the Soviet Union.

The Swedish claims amaze foreign trade experts. In their opinion, nothing has changed since Richard Perle himself announced that he was completely satisfied

with the supervision of our exports. The experts emphasize that special agreements are not needed to check up on our country's few high-tech firms. Moreover, such agreements would be in contradiction with our neutrality policy.

At the Foreign Ministry they say that the governments of the Western countries have at least not yet raised the subject of the export embargo for discussion with us Finns.

"To boot, the Finnish Government does not even have the authority to decide on control of foreign trade," they stated at the Foreign Ministry.

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WEST EUROPE/TECHNOLOGY TRANSFER

EUREKA, ESPRIT GET DANISH MONEY, COMMITMENT

100 Million for Eureka Project

Copenhagen INFORMATION in Danish 18 Apr 86 p 7

[Text] The government will initially request 100 million kroner for the European research project, Eureka, Education Minister Bertel Haarder (Liberal) said Wednesday evening at a meeting in Copenhagen.

The money will be used to provide the maximum effect on Danish research efforts, Haarder said. He urged EC not to allow agricultural spending to squeeze the research and technology budget.

"Biotechnological research contains the key to the solution of EC's agricultural problems. New crops must be developed that will reduce the use of protein, nitrates and herbicides," said Education Minister Haarder.

Ships, AI, Esprit Program

Copenhagen INFORMATION in Danish 18 Apr 86 p 5

[Text] Two Danish firms and a research institute have joined forces with a Dutch firm and the Greek Technical College to work on an EC project worth 6.4 million kroner. The project is aimed at introducing the so-called expert systems on ships that are also known as artificial intelligence systems.

The Ship Technology Laboratory, an Academy for the Technical Sciences (ATV) institute has taken the initiative in forming the international consortium. The Danish firms are the East Asian Company [OK] and the Soren T. Lyngsoe electronics firm, while the Dutch participant is a software firm.

The consortium has a contract with the EC Esprit program, which is providing 6.4 million kroner to finance half the cost of the project. The participants must come up with the other half. The Industrial Ministry's Technology Council has provided 1 million kroner in support which went to the Ship Technology Laboratory, the leader of the project.

Esprit in Second Phase

The Esprit program comes under the EC Commission and represents a European response to the United States and Japan in the area of information technology. The program is designed to support research across national boundaries by the private sector and public research institutes before projects threaten the competitive interests of the individual participants.

Esprit covers a 10-year period and half of its funds come from EC and the rest from participants.

Esprit is divided into five main areas: advanced microelectronics, program technology, advanced information processing, office systems and computer-integrated manufacturing.

A subordinate area consists of so-called "focus projects" that collate and find applications for earlier Esprit projects. It is this kind of project the Ship Technology Laboratory applied for, pointing out that Soren T. Lyngsoe has participated in another Esprit project concerning the design of expert systems.

But the EC Commission feels it is too early to start up focus projects and therefore the project in question has been designated as a potential focus project. Two other projects, one on voice recognition and the other on satellite transmission, have also been funded and the Danish project will be competing with them a year from now on an actual focus project.

The Ship Technology Laboratory defines an expert system like this: "An advanced computer system that can give advice, make decisions and learn from experience in a human way. An expert system can also explain how it arrived at the advice it is giving."

By 1 April 1987 the project is supposed to identify the information available on a ship with respect to monitoring and controlling ship movements, navigation and administration and put it in data form. The expert system will then be used to optimize the ship's route planning.

Experience from this experiment will be used to introduce a far more comprehensive system for ships.

We asked if this would lead to ships without pilots.

"No. Our idea is to give the crew a tool that will enable them to run the ship more efficiently from an economic point of view. 'Should we steer north or south of the storm?' The captain has to decide things like this on the basis of his experience and a lot of different information about the ship, weather conditions, etc. He must take many things into consideration. We are not trying to replace the people who make the decisions, we want to give them a superstructure and thus facilitate communication between the many different information systems," said civil engineer Erik Kasper of the Ship Technology Laboratory.

Esprit and Computerized Offices

The EC administration will be modernized and EC has entered into an agreement with a consortium in which the Danish Data Central Company is one of the participants.

The Esprit program, which is designed to promote European efforts in the area of information technology, has approved 80 million kroner for the project. Data Central will get 12 million kroner of this and must come up with a similar amount for its participation in the project.

According to the publication COMPUTER WORLD, the consortium consists of the Italian firms Societa Generale d'Informatica Spa (SOGEM) and Ing. C. Olivetti and the French firms TESCO Software and Bull. The contract covers 4 years and calls for the development of advanced integrated office-automation systems for the EC administration.

50 Million Boost for Microelectronics

Copenhagen BERLINGSKE TIDENDE in Danish 10 May 86 Sec III p 4

[Article by Henrik Damm; first paragraph is BERLINGSKE TIDENDE introduction]

[Text] The planning group for the Technology Agency recommended that the Technology Council put 50 out of 75 million kroner earmarked for information technology "on the table" at one time. The group specifically mentioned the Danish electronics industry as a branch that would benefit from funds granted by the Technology Development Program. This part of the program would then closely resemble the Esprit model.

Fifty million kroner here and now should make Danish electronics firms more interested in the possibilities for economic support from the Industrial Ministry's Technology Development Program (TUP). And BERLINGSKE TIDENDE has learned that the new feature is that the money will be allocated on the basis of bids, the same principle that applies to the joint European Esprit program.

"We still have 75 million kroner left for information technology projects and in order to make the best use of the money, we have advised the Technology Council that 50 million kroner should be given to projects that are subject to open bidding," said Bent Hoffmann, head of automatization technology at the Technological Institute and a member of the Technology Agency's technological planning group.

This proposal represents a decisive break with past practice. One of the criticisms has been that it was difficult to submit applications and another was that big firms employing experts in writing applications tended to get the funds. In other words it took too long to get relevant projects off the ground.

"It is our hope that Danish firms and institutions will now get together on projects. The planning group has pointed out that projects should be created primarily in the electronics branch," said Bent Hoffmann. He specifically mentioned the areas of development technology, increasing the efficiency of hardware and software, the development of greater working speed for computers (parallel processing), industrial production of software, production technology, integrated production of circuit design, management data bases and interfacing data communication systems.

"We don't want to discover things that other people have already discovered, but we must be aware that developments are constantly changing for our competitors and we must accept that challenge," said Bent Hoffmann.

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WEST EUROPE/TECHNOLOGY TRANSFER

FRG SCIENCE PARK FACES PROBLEMS WITH CAUTIOUS OPTIMISM

Hamburg DIE ZEIT in German 4 Apr 86 p 39

[Article by Suse Weidenbach: "The Pampered Children Are Growing up; the Much Praised Berlin Innovation Center Must Master its First Difficulties"]

[Text] The almost legendary image of the Berlin innovation and company-promotion center has received its first scratches. While in the past superlatives were just good enough to describe the showpiece "Silicon Wedding," the euphoria has given way in the meantime at least at the Spree to muted optimism. Cause of the change in mood: The first attempt to take the management of the company-promotion center with the symbolic acronym BIG into private ownership has failed.

The bad news from the "breeding ground for technologies with a promising future" (as Berlin's Governing Mayor Eberhard Diepgen put it) of course did not get the otherwise customary publicity and if one of the participants had not loudly given vent to his anger, the first scratch would undoubtedly have hardly been noticed. Michael Hoebich, chancellor of the Technical University (TU) which has been administering the center until now, commented on the failure of the private industry solution with the words that BIG and the neighboring "Technology and Innovation Park (TIP)" are on the "dying limb."

But the prematurely sounded deathknell aroused new zest for living precisely among those who were regarded as their own gravediggers. The BIG entrepreneurs themselves, thus far by their own statements "a silent, manipulated mass," felt challenged. Thus far always courted as the pampered children of the economic policy, the "jogging shoe entrepreneurs" discovered the charm of codetermination. "Without us nothing will go any longer; we are going to set the standards for the future work," postulates Norbert Schlimm, paragon among the BIG entrepreneurs and member of the newly elected five-member spokesmen council of the 33 firms.

The young founders close ranks not only because they are angry about Hoebich's comments but also because of the disappointment over the TU information policy. When they found out from the newspaper that according to the plans for the transfer into private ownership of the university, the Deutsche Bank was supposed to assume an influential role in a new management company, "uneasiness was articulated." Especially the small firms were worried about the idea of a dominant "multinational" in the BIG management.

Ursula von Krosigk, co-owner of the "Fuenf-Frau" firm of "tech writers" made her concerns public in the renowned U.S. WALL STREET JOURNAL. The criticism and the slogan "from BIG to Flick" again caused the attacked to retreat: Deutsche Bank, Berlin, had it made known that it would no longer pursue the plan until all participants, including the tenants, had achieved agreement concerning the bank's participation.

The retreat of the bank and thus the failure of the first concept for transfer to private ownership, in which in addition to the financial institute also a U.S. management consulting firm and a German enterprise active in venture-capital business were involved, caused varied reactions. While TU president Manfred Fricke moderately felt that new ways must be found with prudence for the management of BIG and TIP, TU's chancellor felt that 4 years of work had been in vain. This statement by Hoebich, who is treasurer of the Berlin FDP in an honorary capacity, was grist for the mills of the political opposition in the [West Berlin] House of deputies. Horst Wagner, the vice-chairman of the SPD parliamentary group and chief of the Berlin IG-Metall (metal workers union), then immediately trained his sights on the entire "conservative policy of company promotion" of the CDU/FDP administration.

To counteract the rapid decline in industrial jobs in West Berlin, Elmar Pieroth (CDU), head of the economics department, had started early to provide subsidies for young entrepreneurs. From his investment fund, 40 firms, including 28 technology-oriented company-promotion enterprises, have been supported with about DM 25 million since early 1983. An additional DM 20 million was provided by private venture-capital companies. However, only a small part of the 200 technology firms newly founded during the past 3 years were thus supported.

The funds from the pot of the head of the economics department were provided as credit or as silent partnership, thus must be repaid, whereby the first two years, in some projects even the first 4 years, do not require repayment. BIG itself causes expenses of DM 500,000 annually, of which the West Berlin administration assumes half over the medium term (the reimbursement declines with the stay of the firm in the center). The state made a one-time expenditure of DM 6 million for the reconstruction of the former AEG factory on Ackerstrasse in the workers section of Wedding. According to information from the economic administration, the firms pays rents that cover the costs.

The BIG entrepreneurs vehemently reject the idea that they function only owing to the state subsidies. "The money from the city administration goes predominantly to the services apparatus which does not do us much good," says Herwig Michel-Kim of the Entwicklungsgesellschaft fuer Energie und Umwelt mbH. The services in common include, for example, the switchboard, the teleprinter, and the cleaning crews. Michel-Kim, who also is a member of the spokesman council of the firms, meanwhile has created the concept of the "new quality" which is now supposed to be introduced with the beginning of the growth phase in the company-promotion center.

Even though the Technical University--at which by the way many of the young bosses of the firms were educated--has exerted a great deal of effort in the

past, today it can no longer be an attendant partner for the BIG firms, according to Norbert Schlimm, whose firm, R-Ber, during its two-year stay at Ackerstrasse expanded from 2 to 22 employees.

In agreement with his colleagues he criticized that there were no business assistance, no marketing advice, and not even a facility for payroll accounting in BIG. The presentation of the first German company-promotion center succeeded so well externally that it was possible to get away with neglecting the work internally. In the concept recently drafted by the young entrepreneurs of a "new quality BIG," the neglected areas assume great importance. But the BIG people also want to do some things themselves. Thus they could achieve 10 to 20 percent of their transactions with technology advice to other enterprises. "We could pass on our experiences, why not also to Siemens," Schlimm felt.

True to the maxim formulated by Michel-Kim that in BIG after the principle of hope the principle of performance must now apply, the large majority of the firms also favors private business management. Aside from a participation of the banks ("with reasonable general terms, no flagship"), of the BIG firms themselves as well as private technology advice, in the opinion of the spokesmen's council especially industry is to be approached--of course top-class firms such as Daimler-Benz, Volkswagen, Siemens, Mannesmann, and Nixdorf.

The city administration, with the help of which the BIG people want to establish contact with their desired partners, likes to be viewed as moderator between the young entrepreneurs and "potent interests" from the outside whose names Piero's competent department manager, Koppenhagen, does not want to reveal at this time under any circumstances.

Even the Deutsche Bank Berlin, whose retreat triggered the activity, does not sit in a corner to sulk. If a city administration approved concept of the BIG firms and of the business management provided by the TU provides for participation by the bank, "then we are going to think about it," says Kurt Katsch, a member of the board of directors. His creed that it must "for God's sake not be a Deutsche Bank event" is likely to take the latest development into account.

Also the savings bank of the city of Berlin West and the Commerzbank have signaled their interest. Hereby profitability aspects must probably be put aside for the time being. According to Kasch, if income and expenditures are balanced, those who bring about private ownership should consider themselves lucky. He sees the involvement of his bank for company promoters as "support of an entrepreneurial atmosphere" in Berlin, with private industry and not public funds.

City, politics, and the TU, also in the estimate of TU president Fricke, have received "many impulses" through the concept of the company-promotion center. But the attractiveness now turns into routine and "routine causes reverses."

TU president and young entrepreneurs are not sorry at all about the retreat of the university from the management. The management functions arising in BIG in the long run could not be harmonized with the structure of a university, Fricke had stated at the start of his term in office a year ago. The conversion to private ownership first favored by the TU, which provided for a

minority participation of the university without any commitment of its capital had already met with the resistance of Wilhelm Kewenig (CDU), head of the science department of the West Berlin city administration, even before the private interests declared their retreat.

According to Fricke's views, the idea of placing firms near the university is to remain embedded in the TU goals. With the help of a cooperation contract, the university later on wants to achieve its ties to the firms without being responsible for their fate.

The hope that the "jogging shoe entrepreneurs" will succeed in lastingly reviving the labor market is muted even now. According to a study by the Technical College for Economics, the technology firms newly founded in Berlin grew by only 1.7 jobs a year on the average. For the Berlin DGB it is therefore important that the technological developments can be converted into production in the medium term and thus qualified jobs are created. DGB economics secretary Hermann Burghorst however is skeptical about whether or not enterprises which after successful and subsidized development leave BIG, will also remain in Berlin and that thus their success will also benefit the economy of the city.

Whatever they may decide later on, the young Ackerstrasse doers are full of energy: "The substance is gigantic, nothing goes down the drain," assures robot designer Schlamm. And chemist Michel-Kim announces, full of the new company promoting self-consciousness, that they want to be "yeast for Berlin."

"Innovation tourism" is growing in the meantime--7,000 visitors have come to BIG thus far; the latest visit by the federal research minister cost DM 2,780. For prominent tourists the machines are to be cranked up in the future, too, "in the interest of Berlin." But in the future the city should pay for this public relations work, cost-conscious entrepreneur Schlamm proposes. If that isn't in line with the thinking of the private manager....

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WEST EUROPE/TECHNOLOGY TRANSFER

BRIEFS

PIRELLI'S CABLES TO PRC--The Cableport S.p.a. company, an associate firm of the Pirelli Group, has won a substantial order from the Chinese Nuclear Power Authority for the furnishing of cables specially designed for Chinese nuclear power plants. The contract, valued at over \$2.5 million, calls for providing high-technology cables of the Afumex type--a Pirelli trademark--for use in nuclear power installations. The entire gamut of cables to be installed at the plants is to be supplied under this contract: intermediate voltage, low-voltage power, control, and instrumentation. In particular, the instrumentation of cables of the fire-resistant type have been designed and developed by the Pirelli Special Cables company and will enable the continued operation of the nuclear plant's essential services in the event of a fire. The cable, which according to the contract must be delivered by the end of September, will be produced by the Special Cables Company of San Giuliano Milanese and the Pirelli Group's Bicocca manufacturing plant. This sizable contract adds further experience and underscores the prestige already enjoyed by the Italian cable-manufacturing industry. [Text] [Milan FATTI E NOTIZIE in Italian Feb 86 p 19] 9399/13104

CSO: 3698/427

EAST EUROPE/ADVANCED MATERIALS

GEOLOGICAL INFORMATION REGISTRY USEFUL TO CSSR ECONOMY

Prague RUDE PRAVO in Czech 21 Apr 86 p 5

[Article by Blahoslav Braun: "Information System for Geologists--An Automated Registry of Historical and Contemporary Data"]

[Text] The Geofond, national enterprise, is a valuable aid to our national economy which gathers and processes and makes available important information on the geological environment. For 10 years now the Geofond Enterprise has gradually been making the transition from manual forms of processing information into card files to the creation of automated information systems. Their components are automated registers which create a factographic data bank of geology and an automated system of geological information.

The set of important geological information and materials, which was originated in 1919, is unique in the world with regard to territorial comprehensiveness. It contains, among others, more than 200,000 items of information and 10,000 geological maps; annually, 4,000 more reports accrue.

The reports contain important information on such things as the quality of underground water found in test borings and wells and their adequacy, the equipment in use and the method of utilization. These data are processed by the Geofond Enterprise in classic form into a special register. By 1985 this register had recorded 25,177 borings and wells. Geologists, designers, and water management specialists have been utilizing these data for 20 years now in proposing methods and selecting locations for the utilization of primarily local sources of underground water. The importance of this unique compilation increased after 1983 when a definite shortage of water occurred.

The automated register also contains data collected from research and investigative reports on landslides. The idea of these compilations stems from the needs of users who wish to receive a computerized map showing the locations of landslides and a commentary upon requesting information on the locality and characteristics of a landslide. The register is completed for the entire territory of Czechoslovakia and in the CSR alone contains data on 5,900 landslides. The knowledge of historical and contemporary landslide areas is important primarily for capital construction, in resolving legal conflicts, in evaluating the causes of deformation, and in ascertaining the possibilities of the occurrence of new landslides.

No less important is the register of deposits of mineral raw materials. It is utilized primarily in creating the conditions for the protection of the mineral wealth of the nation. That is why its 2,135 entries on deposits particularly contain those which involve the national balance of mineral raw materials. The data on deposits of all raw materials are valued particularly by geologists who are responsible for the operational solution involved in recording extraction sites, the selection of locations for depositing waste materials, etc. Knowledge of the location of raw material deposits, reserves, and the geological conditions facilitate better planning for utilizing raw materials from the point of view of the minimum transportation distance and maximum savings of motor fuels. Gradually, the data will be expanded by including old extraction sites (quarries and sand pits), of which the CSR has more than 30,000 and which can be used for storing waste materials and for other purposes.

Another register contains data on 2,111 undermined areas. Specialists from the Department of Mine History at the Geofond Enterprise at Kutna Hora were successful, by studying archival materials, in identifying the historical territory in which our ancestors extracted mineral raw materials. The data are now being transposed to two independent automated information systems. The first--the factographic one--already contains data on all territories where mineral raw materials were being extracted at one time. The second--which is in the process of being created--is intended to gradually record a broad fund of mine history maps, of which more than 200,000 exist in the state archives of the CSR. A project of this intent is completely unique in Europe and in the world. The oldest mine historical map in Bohemia was dated here. A unique German-Czech mine historical dictionary, which already contains 4,000 entries and will have around 7,000 entries, is in process. This extensive work will make it possible for specialists to comprehend the historical material available which can say quite a lot with regard to present times.

The most extensive and most significant register is the register of 181,928 borings. It makes it possible to rapidly and reliably seek out the necessary documentation on any territorial segment. Thus, for example, while the use of thus far generally used card files for selecting geological documentation for a territorial segment measuring 1 km² required about 1.2 hours, today minutes suffice (including the preparation of questions for the computer). The geologist receives detailed information on the territory selected and, thus, the danger that he would design a duplicative boring or would fail to take into account data from older borings is minimized. In designing new geological works annual savings of several million korunas are accomplished.

The registers of protected territorial areas and segments containing protective strips around mineral springs, hydrological and geophysical research, final reports, foreign travel reports, research design work, etc., are also important for geology and all its branches.

The Geofond Enterprise wishes to implement additional innovations in solving the tasks outlined in the State Goal-Oriented Program P-13, aimed at specifically improving the efficiency of services and the entire system. This will be a matter of fundamental technological and social changes which will be

brought about by the development of electronification, robotization, and information sciences which will play a primary role here. The enterprise is also preparing an important register of geothermal sources and residual reserves of natural gas; together with the Bratislava Geofond Enterprise; it has already prepared a register of secondary raw material waste deposits.

The Geofond Enterprise in Prague is charged with the function of being a branch information center in Czechoslovakia and, within the framework of CEMA, it is charged with being the principal Geoinform organ and with the coordination of establishing unified information services. It also shares in processing studies on raw material resources for selected CEMA countries.

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EAST EUROPE/COMPUTERS

USE OF FOREIGN DATA BASES IN CZECHOSLOVAK FOREIGN TRADE

Prague ZAHRANICNI OBCHOD in Czech No 3, 1986 pp 2-5

[Article by Vlasta Macku]

[Text] In view of the rapidly changing conditions in foreign trade markets and because of constantly growing competition, which forces us to compare our results on an international basis, it is necessary for Czechoslovak foreign trade to have at its disposal, needed, high-quality, and topical information (of the scientific-technical economic type or of the business economic type), on the basis of which it could be flexibly react to changes in external conditions in a manner which would be most advantageous to us.

Apart from classical sources of information, developed countries have been making increasing use, since the 1960's and 1970's, of computerized data bases, created by specialized information companies. The interconnection of these data bases with a computer network enables the user, on the basis of contracts with the appropriate producing organization, to:

- a. either purchase the data base (on a magnetic tape), including the update (in the off-line regime),
- b. or, more frequently, to access it directly through the use of terminals (on-line regime).

Advantages of Computer Data Bases as Opposed to Classic Information Sources

Compared with traditional information sources, data from computer data bases have a number of advantages, particularly the following:

- a) information obtained from data bases is more topical than, for example, book sources or statistics which capture developments with more or less delay, to which must still be added the time required to obtain the appropriate information source. In comparison, data bases are generally updated (once a month, every 2 weeks, or weekly) and the user, thus, has the opportunity, particularly in the on-line regime, of obtaining fresh information which has thus far not yet been published in statistical reviews;

b) the user has the opportunity of utilizing a broader spectrum of information sources which are frequently not available to him in classic form (journals, etc.). He can direct his question to a larger number of data bases which contain hundreds of thousands or millions of items of information. According to the responses obtained, he then has the opportunity, in the interactive regime, to make his selection more precise and to thus obtain information which is most suitable for his purposes;

c) the obtained information is selective, it represents specific responses to specific questions, be it in the form of article annotations or numerical tables, etc. It thus saves the user considerable time because it is no longer necessary to conduct research involving a number of materials or to seek out numerical data and use it in making complex computations. This work is handled by the computer.

Basic Types of Information Available Through Foreign Data Bases

Currently, throughout the world, approximately 2,000 computer data bases, capable of providing two types of information, are operational and substantially differ from each other by the type of users who are capable of exploiting them.

The first type of information accessible through foreign data bases is bibliographic information. This is essentially a question of annotations of appropriate source material, including the title of the item, the author, and source in which the material was published. Information of this type is provided by so-called reference bases, of which around 1,000 exist in the world.

In view of the special requirements of foreign trade for information, reference bases have only limited use. The user learns from them only where appropriate information can be found and must then have access to the necessary source materials,¹ must have the capability and the time to study them, which is not always within the possibilities of the appropriate managers or operating officials. For this reason, reference bases are more suitably applied in production research and development, where it is necessary to obtain very detailed information on a given topic being followed.

In foreign trade it would be possible to utilize data bases containing bibliographic information particularly into cases:

a) within foreign trade organizations to study the activities in the sector (for example, to conduct deep analyses of a commodity or a market, followed by determining the goal-oriented technical-economic parameters of the product involved);

b) to conduct economic research.

Managers and operating officials in the foreign trade business require, and are, to a certain extent, accustomed to receiving, information from various sources already processed for direct use. The source is, for the most part, of interest to them only from the standpoint of credibility and they rarely require the original, as long as the qualifications of the information

processor provide a guarantee that the factographic record reliably relays all significant data pertaining to the processed material.

Thus, for the majority of workers in foreign trade it is much more advantageous to consider the second type of information--the factographic information,² which is also provided by approximately 1,000 data bases throughout the world. This type of information exists particularly in the following forms:

a) time lines--essentially these are statistical data contained in a computer, having the advantage of greater topicality in comparison with book statistics. This information captures data on the internal market (production, sales) as well as in foreign trade (exports, imports) in various degrees of aggregation (the monopolized sectors are more aggregated) which is obtained through the use of appropriate nomenclature. The most detailed data are contained in the NIMEXE system and the SITC system and purely trend-type information (monthly, weekly, daily) can be obtained from numerical data contained in the CLIO-NACE system;

b) abstracts--they represent the capturing of the principal thoughts of the processed material, either in the form of slogans (containing the least detail) or in sentences augmented by numerical data or by tables. Each entry obviously contains data on the information source, some even draw attention to additional details contained in the original article. Subscribers, and possibly even other interested parties, are provided with full texts of articles processed in the entries by the producing enterprise;

c) brief data from official documents--these are one- or two-page official entries pertaining to firms obtained from official materials.

Possibilities for Utilizing International Data Bases in Czechoslovak Foreign Trade

Interested parties in Czechoslovakia currently have the opportunity of utilizing international data bases in two ways:

- a) they can receive data in a batch regime (off-line), or
- b) they can receive data in an interactive regime (on-line).

Obtaining Data in the Batch Regime

In this case, the user turns to the Czechoslovak operator of the appropriate data base and receives continuous (periodic research) or, upon request, retrospective research in the form of printed reviews of primary documents in the sector being followed.

In Czechoslovakia this method makes available 20 data bases (14 from developed capitalist nations, 6 from the USSR) which, however, are not topically directly targeted at foreign trade and are, thus, only usable with difficulty.

The exception is the single factographic base of the entire group--CIN (Chemical Industry Notes). This data base provides business economic information from the area of the chemical industry which pertains to production, price formation, trade, products, etc. The Czechoslovak operator of the data base is the Technological-Economic Research Institute of the Chemical Industry at Pardubice.

In the foreign trade sector, the Chemapol Enterprise is the user of the CIN data base. Good results are being obtained here through the use of the base in the area of retrospective research, the working up of which on the basis of excerpting data from the periodic press would be much too expensive. This is a case in which the data base is used irregularly. According to need, a request is formulated and transmitted to the operator, who then conducts the appropriate research and sends it back to the requestor.

The Chemapol Enterprise has stopped using weekly periodic research data with respect to developed capitalist nations. Apart from the relatively high cost of acquiring this information, the relatively complicated distribution system for information led to the fact that the required trade and economic information was available in the enterprise earlier from primary sources (periodicals on subscription) than it was from the operator of the CIN data base.

Obtaining Data in the Interactive Regime

The obtaining of information through the purchase of magnetic tape data bases represents a nontraditional form of information services. This information, however, arrives in certain, even though brief, intervals which, nevertheless, only partially invalidate the topicality of some information. Because it is precisely the topicality of information which is of great significance in foreign trade, the interactive method of obtaining information in the on-line system should be used to a greater extent.

In conjunction with the developmental trends in the world, we are also currently experimenting with the dialogue utilization of foreign information data bases. Interested parties can utilize the services of the SAVI (Center for the Automated Exchange of Information), which has been operating since the end of 1981 (until 1 July 1984 it was called the NSAP (National Center for Automated Access to Foreign Data Bases). The function of this center for Czechoslovakia³ is the responsibility of the UVTEI (Center for Scientific, Technical, and Economic Information of the UTZ).

The task of the SAVI in its relationship with Czechoslovak users consists of:

- a. planning and realization of communications links between the SAVI terminal and foreign centers;
- b. preliminary preparations of research strategies to handle previously submitted user requests;
- c. actual servicing of the terminal in communicating with data base systems-- submission of problems, making them more precise through the interactive

system, selection of relative information or analysis of data contained in various data base systems which bears on the topic of the problem, and depiction, together with printing out the results;

d. handing over or supplemental transmission of results pertaining to tasks handled to the appropriate organization;

e. determining the cost of the transaction, keeping overall records, and listing the costs accruing to individual user organizations.

In each sector contacts with SAVI were made the responsibility of one or more work sites, which are entitled to act for the sector with the UTZ regarding the conclusion of contracts on the interactive use of foreign data bases. Individual organizations may then establish contact with the UTZ only through these authorized work sites. For the foreign trade sector this function is carried out by the Research Institute for External Economic Relations.

Before formulating the request for contact with a foreign data base, the user has to consult the UTZ (accompanied by a worker from the authorized work site). Here, specialists will judge whether it is likely that the required response can be obtained through this manner. In the event that processing of the request would be ineffective, they can reject its submission.

On the other hand, SAVI selects the most suitable of the preliminarily suggested data bases (contained in the request), addresses them, and obtains or fails to obtain the required response.⁴ The requestor (that is to say, the worker who needs the information) is present throughout the entire communication involving foreign data bases, he can intervene in its course and conduct a dialogue with respect to the required response. In the legal sense, the user is responsible for the meaning and content, whereas SAVI is responsible for everything else. The user is not in direct contact with a foreign country.

Services have been made available to Czechoslovak users from the end of 1981 through the end of 1985 in the form of a free experiment. The limit is only the foreign exchange allocation which is provided to individual sectors by the State Commission for Scientific and Investment Development (SKVTIR). The individual user organizations do not pay for the services but are obligated to evaluate, for the UTZ, the value of the information obtained from the foreign data base (for example, growth in exports, improvement in prices, etc. Processing of a request⁵ through the SAVI costs an average of 400 Kcs in foreign costs. Requests of an economic nature are more expensive; one request from the most used economic data base--the CISI--costs an average of 917 Kcs in foreign costs and 400 Kcs in domestic costs.

The SAVI makes it possible for Czechoslovak users to become familiar with a number of foreign data bases and to determine the extent to which the individual sets of information can satisfy their information needs. Thus far, the UTZ has concluded commercial contracts or agreements on cooperation with 12 data base centers (4 in the USSR, 1 in Bulgaria, 7 in developed capitalist nations) which facilitates direct access to about 200 international data bases

in 18 different sectors. There are 50 purely factographic data bases, the rest provide only bibliographic information. Some centers, however, make it possible to obtain copies of the primary documents.

Despite the significant number of accessible data bases, their selection and testing for use in foreign trade is not simple. I personally believe that it would be possible to make successful use of foreign data bases of the following types for solid preparations of negotiations with customers:

a) data bases containing processed statistical data--the output from these bases are timely basic data or computed indicators. The most significant producer of this type of information is the CISI Center at Wharton which has some 40 data bases available with statistical data on national accounts, economic situations, foreign trade, social spheres, agriculture, research, energy, and the aircraft industry. Territorially, they cover the European Economic Community, the United States, Japan, and the Benin Treaty nations, including their ties to the entire world.

A number of CISI data bases would be usable in obtaining data on competition in the economies of capitalist nations, but data bases also exist which are exclusively aimed at foreign trade. The most significant of these, and the one most widely used in our country, is the COMEXT data base, containing data on foreign trade transactions (in value and physical unit, so that calculations can yield data on average prices for a given commodity or group of commodities) covering the countries of the European Economic Community and also countries outside the European Economic Community where at least one of the participants of the trade is a member of that integration grouping. The base is operated by the NIMEXE system and its data are updated every 14 days;

b) data bases of a prognostic character--prognostic data is provided particularly by the Predicasts firm in the PTFC data base (Predicasts Forecasts). This base is a factographic one and contains information on published prognoses in the area of industry, trade, and economics in general, both short-term as well as long-term forecasts.

Additional possible sources for prognostic information are represented by the outputs from the CISI Wharton system, particularly the WEFAN data base, which provides weekly international economic reviews, data on currency in circulation and finances, as well as the anticipated outlook for the American and international economy. Simultaneously, Wharton provides economic prognoses and analyses which are oriented, either on a worldwide basis (overall economic activity, development of foreign exchange rates and interest rates, agriculture) or on a regional basis (socialist states, Near East, Pacific region, and North Africa, Latin America, Mexico).

The scope of outputs is very broad and encompasses weekly reports, quarterly reports on balances of payment and indebtedness, semiannual reviews of the overall situation connected with short-term outlooks, annual prognostic studies (for 20 years) and special reports;

c) bases containing central data on firms--these data bases could be utilized by foreign trade as a source of official commercial information on companies with which we would like to establish contact. They contain data on capital, employees, producers, branch operations, turnover, balances, and other substantial assets of firms in appropriate countries.

The following data bases are among the information sources of this type:

DEFO--information on firms listed on the French stock exchange;

ESSO--central reports on 70,000 French enterprises;

HONL--data on 20,000 Dutch firms;

HOPE--data on 20,000 West German firms;

KBE--data on 20,000 British firms.

From the information standpoint, the territory of western Europe is thus covered. Currently, negotiations are ongoing regarding access to bases containing data on American firms and contracts valued at more than 10,000 USD;

d) bases having an industrial financial direction--these represent annotations in world periodicals from the area of management, economics, and trade. They can be used, for example:

a. for unofficial reports on firms;

b. to obtain information on producers, markets, and economic life (reports on prices of comparable products);

c. to obtain information on producers, markets, and the economic life (for these purposes, some of these data bases are actually being used by Czechoslovak representatives, for example, before visiting certain countries or before negotiating with their political or commercial circles.

The most significant bases of this type are represented by:

a. FINTEL, from the production of Fintel Co. Newsbase, which annually encompasses some 50,000 items of information taken from articles having an industrial financial bent and appearing in the London and the Frankfurt issues of the FINANCIAL TIMES. The entry is an abstract of about 50 words;

b. PROMT (Predicasts Overview of Marketing and Technology)--presents in primarily textual form brief excerpts or compilations accompanied with occasional tables (approximately 13 percent of specially marked entries) from more than 1,500 sources of various types--the press, government, and commercial periodicals, bank announcements, prospectuses, studies, etc. The data base is capable of providing information on the activities of firms, new technologies, and producers;

c. ABI/INFORM, provided by Data Courier, Inc.--annotates more than 400 periodicals, primarily from the United States. It deals with regional economic matters, management, public reports, the banking industry, accounting, the legislative efforts, etc.

Some socialist countries utilize the Dow Jones Index, containing financial and stock exchange information. However, these bases were not contracted for because of the lack of interest of Czechoslovak users;

e) guide-type data bases for various products--use of these "computer catalogues" is just beginning to expand in the world. It could mean a great savings of time in looking for desired products (in imports) and would provide a rapid review of the offerings by the competition (for exports). In this country, for the time being, the guide for selected electrotechnical products is available;

f) data bases containing information on patent protection--it will be possible to utilize these data bases to ascertain whether and in which countries the appropriate product might be protected by patent.

Thus far, the experimental use of foreign data bases through the efforts of SAVI shows that this decision was correct and useful. The tested data bases usable in foreign trade, for the time being, originate with developed capitalist countries. The socialist countries do not have data bases which would be appropriate to the needs of workers in foreign trade. However, for the future, it is not possible to rely exclusively on data bases from capitalist nations because of the following two reasons:

a. because of the territorial aims of our foreign trade business, we need special information on socialist countries;

b. in view of the political sensitivity of the information area, the danger exists that some information from capitalist nations will not be made available to us for international political reasons.

Restrictions of the access of socialist countries to selected information contained in the data bases of capitalist nations can take on two forms:

a) the blocking of information for participants from socialist countries--an example of this process can be the policy of the United States which, in 1982, adopted special rules for differentiating information according to its strategic significance. In conjunction with categorizing information into individual groups, the possibilities of access to this information differ according to the country of origin of its potential user. The American rules differentiate between the following documents:

a. documents important to the defense of the United States,

b. documents accessible only from the territory of the United States and only by privileged users, containing new technical, commercial, and technological information;

- c. documents not accessible from the socialist countries;
- d. other documents.

The above rules make it more difficult, even though to a lesser extent, for users in western Europe to access the data. For this reason, a number of European firms are buying out weaker American enterprises with the right of privileged access (for example, the French CISI company, which provides information for the nuclear program, acquired the American firm of Wharton in 1983, which is the leader in processing economic information on socialist countries);

b) deliberate distortion of information provided--this practice is in use particularly in the area of economic information. According to reports by representatives of the CISI firm (within the framework of the lecture given by Mr Praus at the UTZ), the data bases contain deliberate distortions of data pertaining to conditions within the individual monopolies and data which have an influence on the defensive capability of the nation. Use is made either of data which is completely incredible or data are aggregated in such a way that it cannot be broken out.

For these reasons, it will be necessary for the socialist countries to constantly increase their own information potential.

CEMA member countries set themselves the goal in 1976 in the area of scientific-technical information pertaining to foreign trade to establish an international branch system--VNESTORGINFORM. From the standpoint of content, this system should deal with foreign trade, the economies of CEMA member countries, third countries, etc.; in other words, it should contain scientific-technical economic information. For this reason, the Research Institute of Economic Relations was designated the guarantor for the Czechoslovak side in establishing the system. Work on the sector system of foreign trade information is currently being concentrated still on the establishment of a dictionary. It transpires that the substantive portion will be clearly broader than scientific-technical economic information and Czechoslovakia faces the problem of a guarantor because the Research Institute of External Economic Relations could not participate with respect to a number of entries of the dictionary in preparation. Despite the efforts of the Czechoslovak side, it has, thus far, not been possible to clarify the topical side of the system.

In its final configuration, the MOS VNESTORGINFORM system is supposed to represent a highly progressive and more efficient information system for Czechoslovak foreign trade purposes. Apart from the stated intent to satisfy the needs of foreign trade, the costs involved in obtaining the necessary information will be lower than those involving data bases from capitalist nations (the accounting of information services involving socialist countries will be conducted on the basis of mutually advantageous agreements).

Barriers to the Utilization of International Data Bases in Czechoslovak External Economic Relations

Foreign data bases have thus far not been utilized adequately in Czechoslovak foreign trade. These information sources are turned to mostly by research and developmental establishments or by managers in production who use this way of verifying and objectifying information presented to them.

The covering of information needs of the sector in the area of factographic information and, to a much lesser extent, of bibliographic information by international data bases has the following main limitations:

- a. a lack of information on the part of foreign trade employees regarding the fact that services which facilitate access to foreign data bases are provided in this country;
- b. a system of incentives for foreign trade employees which does not force them to select appropriate information because they can manage to get by without such information in foreign trade transactions;
- c. the relatively high amount of time required for contacts with foreign data bases which, for many employees in their opinion (sometimes even objective) represents an intolerable time burden; the formulation and approval of a request, contact, including consultation at the center and consultation at SAVI (possible even telephonically), communication with a data base and subsequent evaluation of the results of the information consume an average of 1 working day;
- d. the problem of understanding the output (some are not too clear); outputs which are clear such as tables, graphs, arranged citations of principal ideas, etc., are needed;
- e. the problem of content coverage of the needs of foreign trade from foreign data bases; data bases oriented directly toward foreign trade practically did not exist before the acquisition of the CISI system and even the CISI system contains purely numerical data. The testing of other data bases which are usable in foreign trade is a question of time and the existence of correctly formulated requests;
- f. the financial question--this will be a problem largely for the future because until 1985 services are provided free of charge, including the services of the SAVI. Beginning in 1986 these services will have to be paid for, and a central foreign exchange fund is to be created for this purpose. Users will pay for acquiring information (the koruna equivalent of foreign exchange means), they will pay for services by SAVI (300 Kcs per hour in dealing with socialist countries, 1,400 Kcs per hour in dealing with developed capitalist countries). The expenditures should then be returned in the form of correct decisions in trade policy which should be carried out on the basis of the acquisition of high-quality and timely information.

FOOTNOTES

1. Roughly in 50-90 percent of the cases, it is possible for Czechoslovak users to obtain the basic source (through interlibrary loan services provided by the STK). Similarly, it is possible to obtain materials through direct purchase--up to 10 pages of photostatic copy and on microfiche for a larger number of pages.
2. In foreign terminology, information which makes it possible to find facts (fact finding).
3. With respect to the other socialist countries, the NSAP is operating in the USSR, in Bulgaria, in Poland, in the GDR, in Vietnam, and in Cuba. These centers are mutually interconnected.
4. An average of two-thirds of the requests are responded to by the UTZ; the available data bases fail to provide answers in the remaining one-third of the cases.
5. A request is a problem with which the user turns to the SAVI. One request may yield several questions, that is to say, several specific instances of access into some foreign data base.

5911

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EAST EUROPE/COMPUTERS

USE OF COMPUTERS IN SLOVENIAN RAIL TRANSPORT

Zagreb VJESNIK in Serbo-Croatian 11 May 86 p 4

[Article by Stane Pucko]

[Text] The telephone is constantly ringing in the computer development center of the Ljubljana Railroad Enterprise. Customers from all over Yugoslavia and Europe are calling, usually with a specific question: Tell us the present location of our goods in car number such-and-such....

On Tuesday at about 1500 hours we were in front of the computer with two young specialists, Niko Skorc and Franc Pinter. A forwarder from Belgrade called. Skorc received the message, and it took Pinter only 20 seconds to tease out of the computer information on a car loaded with nails, obviously for export. The car with a 12-digit number dispatched from Belgrade on 6 May had crossed the Yugoslav-Italian border at Sezana. Skorc made the brief report over the telephone, and the customer on the other end of the wire was obviously satisfied.

For each of the 12,000 freight cars traveling every day on Slovenian railroads, at virtually any moment they know in the railroad computer center in Ljubljana exactly what car is referred to, who its owner is, what it is loaded with, and whether it is en route or involved in some other process. They know which freight train the car is in, its point of origin, and where it will be at a particular time and a number of other pieces of information which railroad personnel and their customers need.

A Renaissance After a Crisis

The railroadmen will not reproach us if we say that the new computer information system marks a farewell with the old system established back in the time of Austro-Hungary. This is not to belittle the great efforts made in the decades which have passed, which have brought the Slovenian and Yugoslav railroads numerous valuable technological innovations without which more rapid and safe transport of freight and passengers is simply no longer possible. What has now been introduced in Ljubljana as the center of the Slovenian and Istrian railroads is so impressive, useful, and effective that it can be referred to as a historical step in the technological and information revolution. Many European countries in west and east still do not have the kind of system

that has just been introduced in Slovenia and is already being introduced in Croatia with its activation scheduled for the end of this year, while they have already shown an interest in Bosnia-Hercegovina and Vojvodina.

"The renaissance of rail transportation after the energy crisis, the ever larger volume of traffic, which is giving rise to bottlenecks, and the economic difficulties of the railroads because of the rapid rise of costs--all of this forced us to reflect about the best way of improving our organization and handling the volume of rail traffic. It was soon clear to us that we could no longer monitor 12,000 different freight cars and about 1,700 passenger cars in the old way, that is, on foot! Freight cars are too expensive a capital asset for us to be able to afford to utilize them inefficiently, especially those which we borrow from abroad and on which we pay rent in gold Swiss francs. They represent almost one-fourth of the total fleet of cars. Every car held beyond the time allowed is very expensive. In 1983 alone this cost us 500 million dinars," explained Dr Bogdan Zgonc, supervisor of the sector for informatics.

That is why in 1982 a team of young specialists was created to write a computer program to handle traffic on the Slovenian railroads. Those 10 enthusiasts who were not much concerned about fame and riches began almost from scratch. They leased a part of the capacity of the computer of the Rijeka PTT, they imported (or leased) other computer equipment, and within a period of 3.5 years the Ljubljana team developed and built an information system for traffic control which has fully justified the purchase of their own new "Sperry Univac" computer which performs 3.8 million operations per second. It was installed 2 months ago, it cost 1.5 billion dinars, and it was paid for with the help of the European Investment Bank.

Billions Saved

The transfer of the system from the Rijeka computer to their own computer took just 1 day, since the complete software had been developed previously on the leased equipment. The economic benefit of the new system is another known quantity: The annual cost saving will amount to 1 billion dinars at the beginning solely because of more efficient handling of the fleet of cars! But the same team is developing and preparing new programs which will facilitate more precise management throughout the business operation of the railroad industry. The terminals now being introduced at the most important railroad stations--there are 50 of them already, but there will ultimately be about 200 of them--will also be introduced in the administration. Almost every office, Dr Zgonc says, will get its own terminal. How does the information system of the Slovenian railroads operate? The main goal of the system is to monitor every car entering the territory of the Slovenian railroads up until the moment when it leaves that territory. Every car, for example, at Dobova, is immediately entered into the computer with all the characteristics of the car itself and its freight along with its routing. Trains are no longer monitored with pencil and paper. The figures read from every car are sent by walky-talky to the railroad station and entered at the terminal. All the information from the waybill and train schedule are entered into the computer, this is supplemented with new data on the movement of the car, so that it is possible at any

moment to notify any station with a terminal when it can anticipate a particular freight train and how it should handle it. Because the information is up-to-date, customers are also notified in advance when the car with the freight they expect will arrive, which is very important to optimum organization of unloading and loading.

But the "menu" of the Ljubljana computer is very diverse. Along with the status of cars, trains, and locomotives, and freight, it offers information on various possible alternative routes for almost all of Europe, all the way to Iraq. This is something new in the commercial offering of the railroads. Instead of the painstaking computation and study of train schedules, the computer now traces out the route of a car shipment, say from Novo Mesto to Dresden, in several alternatives in just a few seconds.

On Tuesday, during our visit to the Ljubljana railroadmen, there was not a single car on the tracks with an especially hazardous cargo. Shipments of that kind are given special treatment by the computer, and this is an exclusive innovation even for the well-known information systems of the European railroads. That is, should there be an accident, rapid and professional intervention is extremely important--we need go no further than our own experience, which has not always been efficient, to find evidence of this. All the necessary data are prepared in the computer for this purpose, and if necessary they are immediately sent to the terminal of the nearest railroad station, or the people at that station may request the data from the headquarters in Ljubljana. The data contain the characteristics of the hazardous cargo, its impact on the environment and population, the method of neutralizing that impact, and the rendering of first aid....

The Ljubljana system also provides numerous other pieces of information and affords the basis for various interventions. For example, our newsman's curiosity was unable to surprise Skorc and Pinter and their computer system. We wanted to see how cars were moving in the port of Kopar, whether there were lengthy delays of the cars, and so on. We hope that the official in charge of railroad transportation in that port will not be offended by our recommendation that he see what has happened to freight car No 317259587762, which he received 28 days ago from Doboj. So that it can be found more easily, this is a gondola car owned by the Yugoslav Railroads.

Railroad Personnel Reborn

"One of the most important objectives of this information system is to shape new business relations between the railroads and those with which they do business. The system, that is, is an economic instrument for more efficient behavior," Dr Zgonc said.

The people from Ljubljana have already sold their system to the Croatian railroads, and it is already being introduced with the help of a computer leased in Cakovec, so that when their own computer arrives this year, they will already be prepared for complete organization of the information system. It is important that the computers in the different centers be compatible. This means that the same answer must be obtained to a particular question on every computer.

In any case the railroadmen are on the best road toward organizing the first complete information system in the country. A special coordinating group has been established at the level of the Yugoslav Railroads for introduction of the system. The Slovenian program has aroused international interest. In addition to Croatia, Bosnia-Herzegovina, and Vojvodina, a major portion of the Yugoslav Railroads will be covered by this system. Railroadmen from the other republics and SAP Kosovo have not yet made a decision, although there are no good reasons for procrastination. Not even financial reasons. Our railroads are certainly financially capable of purchasing the necessary computer equipment in a very short time. A computer costs as much as renovating 15 km of track. Prompt training of professional personnel from the very top down to the freight stations, which number a total of 955 in the country, is a bigger problem than money.

In Slovenia, meanwhile, it has turned out that computer literacy can be surprisingly effective on the railroads.

"Four years ago our railroad people shook their heads with suspicion when we began to talk to them about computers. Nevertheless, in a short time they have been transformed from administrative personnel flooded every day with a heap of paper to users of modern technology," Zgonc said. "Now if we took the computers away from them, they would certainly go on strike."

7045

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EAST EUROPE/COMPUTERS

HUNGARY'S MICROCOMPUTER EXHIBIT APPRAISED

Budapest HETI VILAGGAZDASAG in Hungarian No 13, 29 Mar 85 pp 40-41

[Text] Mikro '86, the First National Microcomputer Meeting, was organized March 14-19 by the Janos Neumann Computer Society in collaboration with TIT [Society for the Propagation of Scientific Knowledge] the Science Organization and Information Institute, the KISZ Central Committee and Hungarian Television. Although the meeting, previously advertised as free, began with a peculiar mass scene, at the end it presented a positive overall picture to the visitor.

On the day Mikro '86 opened, at 10 o'clock, a good number of interested people gathered at entrance 2 of the BNV (Budapest International Fair) because everyone who inquired about the event was sent here from the other entrances. The next 1-2 hours were spent amidst surprises. The very first was that no one was admitted without a ticket. It is true--as it turned out--that entry to the microcomputer meeting in pavilion 24 was free but only for those who purchased the 20 forint--on specialist days 40 forint--ticket to the Travel '86 exhibition shown concurrently.

Of course, those who came this far would hardly turn back because of the 20-40 forints. But now came the second surprise: Tickets could not be purchased because the ticket agents did not yet arrive. At 11 o'clock, after they finally had arrived and ticket sales started, came the third surprise: The ticket handlers continued to keep the gates closed because--they said--they were "instructed" by phone that by now they should not let anyone in even if they had a ticket. The incensed mass of people chose a "democratic" solution and crashed through the iron gate. Thus the mass of people numbering several hundred finally entered.

On the next five days of the meeting there were no more such incidents. From 10 o'clock on, everyone with a ticket could enter the exhibition which was open from 9 o'clock every day. For instance, one could visit the first organized program, the microcomputer exhibit. Thanks to the at-cost organization, participation was inexpensive and affordable to many. Thus, among the 55 participants of the exhibit, the significant domestic large enterprises were joined by 10 small cooperatives and business partnerships which had also rented individual stalls. The final goal of the exhibit was to demonstrate various microcomputer applications. While an exhibit

of similar nature, organized 3 years ago, had the goal of capturing the children, this year it was the adults' turn. According to preliminary plans, the organizers wanted to demonstrate the many possible applications of a home computer within the household. It is indeed regrettable that there still are relatively few "user friendly" programs requiring no basic training and easily used by complete outsiders to the field.

Although, basically, the exhibit promoted not machines but possible applications, nevertheless, a few remarks are appropriate. For example, it was somewhat disturbing that every third micromachine at the exhibit was of the Commodore 64 type. Even more distressing is the predominance of C-64 among the user programs. It shows that, in Hungary, much more is expected from this indeed remarkable hobby machine than it is capable of but it also shows that price is still a great impediment to the domestic spread of computer technology. Today, C-64 represents to us the optimal price and achievement. On the other hand, at the press conference, hope was raised by the announcement of the Videoton representative that the price of the TV computer had been lowered from 19,900 to 12,800 forints and that "even by assuming risks, they are starting an intensive lowering of prices" with the total of 7000 units to be marketed this year although the 5 digit prices are not yet truly attractive.

The visitor eyeing the machine selection could also notice about 20 different makes of IBM PC/XT compatible machines shown at the exhibit. Bringing the excellent XT machines into use in certain fields of application is a good idea. However, the service demand, parts supply, software and hardware demands of the many different machines from various sources can be a source of almost insoluble, severe problems.

The discussions related to computer technological teaching and dialogues between the editors and readers of domestic computer technological magazines proved to be exciting events at the microcomputer meeting. Many were attracted to the exhibit on the history of computer technology the material having been provided by the Technological Museum. A foreign visitor at Mikro '86 was the president of the Greek Computer Society, Heinz Zemanek, who designed the first practically useful European computer in 1955. At the same time, the demonstration of computer technological films and video pictures, and the sale of computer technological parts was less successful than anticipated by the organizers. On the other hand, the computer technological music performance and concert enjoyed unexpected, overwhelming success; this time, people were practically "hanging from the chandeliers."

About 80 microcomputer programs arrived for the programming competition. It is especially gratifying that only 30 of them were games and the other 50 were educational programs. Consequently, the children are no longer writing predominantly game programs but they are producing programs to teach languages, physics, computer science, Hungarian spelling or even Kresz rules and innumerable others. One special room of the exhibit was turned into a busy flea market during the "chip exchange." Computer hobbyists were selling, buying and exchanging their programs, parts and other computer wares.

It was a nice humanitarian gesture of the meeting to present "The Health Impaired and Informatics." It drew attention to the fact that, with talking computers and other tools, health impaired people can also be involved in the use of computer technology and can become full-fledged workers.

The computer building competition for hobbyists was awaited with keen interest. It was not the goal of the competition to increase the number of patented, Hungarian-built microcomputers which already number over 100. Rather, like the early radio hobbyists, it attempted to raise interest in machine building as a hobby and to disperse the mystical fog around machines.

All in all, the organizers should certainly be satisfied: They have essentially reached their goals. Moreover, in spite of its definitely modest advertisement, Mikro '86 was obviously also a great contributor to the attendance at Travel '86. Therefore, it should be mentioned that the First National Microcomputer Meeting was part of the Budapest Spring Festival. Nevertheless, it was quite a task to find the two lines, in small print, which announced it in the 24-page program booklet of the festival. Perhaps many people are of the opinion that microcomputers have no place at a cultural festival. But hopefully, even more people maintain that computer technology is becoming more and more an organic part of our culture--as it was also confirmed during the current meeting.

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19 June 1986

EAST EUROPE/CHEMICALS/PHARMACEUTICALS

PRODUCTION OF MINERAL FERTILIZERS IN BULGARIA

Sofia KHIMIYA I INDUSTRIYA in Bulgarian No 1, 1986 pp 43-48

[Excerpts from article by Ivan Kurshev, Higher Chemical Technology Institute, Sofia: "Production of Mineral Fertilizers--Development and Scientific-Technical Progress"]

[Text] Development of Artificial Fertilizer Production in Bulgaria

Fertilizer production has had a short history in Bulgaria. Manufacture of such fertilizers began in 1951 with construction of the first nitrogen fertilizer plant (today an integrated chemical plant) in Dimitrovgrad. Within a short period it had developed to such an extent that Bulgaria became one of the most advanced countries in fertilizer production (more than 78 kilograms of primary component per inhabitant). The artificial fertilizer industry is one of the most highly developed industrial sectors in Bulgaria, one with which development of the basic chemical industry begins. The Bulgarian fertilizer industry today manufactures the intermediate products needed in making nitrogen, phosphate, and complex fertilizers. It fully meets the country's needs for nitrogen fertilizers, and to some extent for phosphate fertilizers as well. No potash fertilizers are produced.

Nitrogen fertilizers. The first installations for nitrogen fertilizer production were built in Dimitrovgrad over the 1948-1951 period, on the basis of projects (technologies and equipment) supplied by the USSR. The raw materials base is represented by enriched Maritsa coal gasified in fluidized-bed gas producers. The process gas obtained is converted to ammonia, and the latter to nitric acid, ammonium nitrate, and small amounts of sodium nitrate. The initial capacity was 40,000 tons of 100-percent nitrogen. The nitrogen fertilizer plant more than doubled in size over the 1957-1959 period. In 1963 a nitrogen fertilizer plant (now an integrated chemical plant) near Stara Zagora commenced operation, producing ammonia, nitric acid (by the combined method), and ammonium nitrate. It as well was built with the assistance of the USSR. Lignite from Maritsa-East is used as the raw material. A plant for production of 40,000 tons of carbamide per year began operation in Dimitrovgrad during the 4th Five-Year Plan. Gasification of fuel oil, which greatly intensifies production, began during the 5th Five-Year Plan, initially at Dimitrovgrad and later at Stara Zagora.

Nitrogen fertilizer output increased sharply during the 6th Five-Year Plan as a result of construction of the integrated chemical plant in Vratsa (with a

capacity of 400,000 tons per year) processing natural gas from the deposit near the village of Chiren and carbamide (600,000 tons per year) under a Netherlands license and with Belgian equipment. The plant commenced operation in 1968.

The organization of caprolactam production at Stara Zagora in 1969 and expansion of such production in 1978 inaugurated the manufacture of considerable quantities of ammonium sulfate as a by-product.

An integrated mineral fertilizer plant (now a nitrogen fertilizer plant and phosphate fertilizer plant at the Devnya integrated agricultural enterprise) was built during the 6th Five-Year Plan. It includes the following.

An ammonia plant with a production capacity of 200,000 tons per year, using British technology and with low-octane gasoline as the raw material.

A nitric acid plant using French technology ("Grande Paroisse").

Plants for complex nitrophosphate fertilizers, with a capacity of 720,000 tons per year using technology from Holland ("Stamikarbon"). The fertilizers are obtained by decomposition of phosphorite with nitric acid, precipitation of the excess CaO with ammonium sulfate, and conversion of calcium sulfate to ammonium sulfate and CaCO_3 , the ammonium sulfate being returned for precipitation of CaO.

A plant with a capacity of 200,000 tons per year of ammonium sulfate, as an intermediate product resulting from conversion of calcium sulfate with ammonium carbonate by the ICI technology.

The production of ammonia at all the integrated plants has in recent years been carried out with natural gas as the raw material, at Devnya since 1978, at Stara Zagora since January 1980, and at Dimitrovgrad since the end of 1980.

In 1980 the production of nitrogen fertilizers in Bulgaria amounted to 797,400 tons of ammonium nitrate, 634,800 tons of carbamide, 137,000 tons of ammonium sulfate, 15,400 tons of sodium nitrate, and 89,500 tons of ammonium hydroxide.

During the 8th Five-Year Plan, the integrated chemical plant in Vratsa was rebuilt and expanded and ammonia output was raised from 100,000 tons per year to 200,000 tons per year. Reconstruction was also carried out at the integrated plant in Stara Zagora. Work was started on general rebuilding of the integrated plant in Dimitrovgrad, where a modern ammonia plant with a capacity of 408,000 tons per year and an ammonium nitrate plant with a capacity of 450,000 tons per year are under construction.

Phosphate fertilizers. The production of phosphate fertilizers began with commissioning of the first plant for manufacture of ordinary superphosphate in Dimitrovgrad, with a capacity of 40,000 tons per year of P_2O_5 , using technology and equipment supplied by the USSR. The raw material is apatite concentrate from the USSR.

An EFK (wet-process phosphoric acid) plant having a capacity of 110,000 tons per year of P_2O_5 made by the dihydrate (Prion) method was built in Dimitrovgrad

in 1967, and manufacture of double superphosphate by the chamber process was organized on the basis of this plant.

Facilities for production of EFK (with a capacity of 220,000 tons per year of P_2O_5) on the basis of phosphorite by the technology applied at Dimitrovgrad² and a plant for production of double superphosphate by the non-chamber process (350,000 tons per year) were built at Devnya in 1973.

Modern sulfuric acid plants were built at Dimitrovgrad and Devnya to satisfy the needs for this acid.

A new plant for production of double superphosphate by the non-chamber process, similar to that at Devnya, was built in Dimitrovgrad in 1984.

The growth of the Bulgarian fertilizer industry has been characterized by the fact that world-level scientific and technical accomplishments in this sector have been applied in every stage of this growth. Lignite coal as a raw material for ammonia manufacture was initially replaced by fuel oil and then by natural gas, the appropriate engineering solutions being applied. The ammonia production technologies have also been replaced by improved ones. Liquid nitrogen washing of carbon monoxide has been adopted at Stara Zagora to replace copper-ammonia cleaning of the gas, and more advanced methods for production of ammonia and higher-output assemblies have been introduced into the plants at Vratsa and Devnya. Of the plants currently in operation, the one at Devnya is the most modern and the most productive. The ammonia plant under construction at Dimitrovgrad has the best technical and economic characteristics. The situation is similar in ammonium nitrate production. The model installations in operation at Stara Zagora have been upgraded by introduction of a third stage of finished product evaporation and cooling with air in a fluidized bed apparatus. The latest developments in ammonium nitrate manufacture have been incorporated in the new AS-72 plant under construction at Dimitrovgrad (high assembly output; single-stage evaporation of the solution; introduction of static and monodisperse granulators ensuring a high (50-percent) yield of granules 2-3 millimeters in diameter and increasing the productivity of the granulation tower; introduction of additives to the solution and treatment of the granules with surface-active agents to improve finished product quality; granule cooling in an external 3-section fluidized-bed apparatus permitting cooling of the product to the desired temperature independently of the season of the year; removal of harmful impurities from the evaporator gases and the granulation tower air). Carbamide manufacture involves a technology including complete liquid recycling and meets modern requirements.

Bulgaria's fertilizer industry of Bulgaria has been completed in general outline. There are plans for construction of a new carbamide plant and new H_3PO_4 facilities in Dimitrovgrad, in order to match the facilities already built for ammonia with ones for ammonia processing and to meet the phosphoric acid requirements of the new double superphosphate plant. Future development will be aimed at intensification and modernization of existing production.

The needs of agriculture are fully satisfied from the viewpoint of the amount of nitrogen fertilizers produced, but the assortment is greatly restricted. The basic varieties are ammonium nitrate (including stabilized ammonium nitrate), carbamide, ammonium sulfate, and a small amount of sodium nitrate.

The phosphate fertilizer situation is even more unfavorable. Even from the viewpoint of quantity they fail to meet the needs of the country and are restricted in assortment, which is made up chiefly of double (triple) superphosphate and a small amount of ordinary superphosphate. Small amounts are made of a complex liquid fertilizer for leaf nourishment (Fiksall), which contains macroelements and microelements.

To ensure fuller satisfaction of the fertilizer requirements of agriculture and to increase the effectiveness of fertilizer application, it will be necessary in the coming years organize the production of blended fertilizers (through bulk blending), as well as the production of liquid nitrogen and complex fertilizers, chiefly in suspension form.

Over the entire period of development of the fertilizer industry, Bulgarian scientific personnel and specialists of the Bulgarian Academy of Sciences, the Higher Institute of Chemical Technology in Sofia, the Higher Institute of Chemical Technology in Burgas, the Central Institute of Chemical Production, the Integrated Scientific Research and Design Institute in Devnya, the IMKhP in Dimitrovgrad, the research and development bases in Vratsa and Stara Zagora, and other institutions have concerned themselves with one problem or another connected with production and have achieved significant success. Some of the most essential projects and scientific and technical accomplishments are reviewed in what follows.

Ammonia production. Technologies have been devised for production of low-temperature and medium-temperature catalysts for carbon monoxide conversion and methanol synthesis, as well as technologies for production of catalysts for methane conversion and oxidation of hydrogen sulfide and hydrogen and adsorbents for cleaning and separation of process gases. A catalyst production shop has been built at Vratsa on the basis of these and other achievements and has started operation.

The removal of carbon dioxide from process gas has been intensified through introduction of diethanolamine as process activator, and intensification of ammonia synthesis has been accomplished by means of cyclic systems. Energy technology systems have been developed for synthesis of ammonia, with the aim of rebuilding the existing facilities and improving their efficiency.

Nitrogen fertilizers. Original technologies have been developed to improve the physical and mechanical properties of ammonium nitrate and carbamide so as to permit bulk-state storage and handling of these substances. A carbamide modification technology has already been introduced, and an ammonium nitrate technology is now in the introduction process. Methods have been elaborated for producing nitrate and carbamide with microelements; these methods can be applied at existing plants. Technologies have been developed for improving the performance of finely crystalline ammonium sulfate by compression molding, whereby a granulated product possessing good physical-mechanical and agrochemical properties is obtained, a technology for producing non-compacting sodium nitrate, etc. A technology for production of ammonium nitrate made in complex nitrophosphate fertilizer plants, developed by specialists at the Devnya Integrated Scientific Research and Design Institute, has been introduced at the Devnya SKhK. Technologies have been elaborated for producing liquid nitrogen fertilizers based on ammonia, carbon dioxide, and ammonium nitrate, and on the basis of carbamide and ammonium nitrate. Pilot-scale production of the final form of liquid fertilizers with nitrogen in concentrations of 29 to 32 percent nitrogen has been organized.

Phosphoric acid fertilizers containing phosphorus. In the area of wet-process phosphoric acid technology a method has been developed and introduced which allows intensification of the process at existing plants by the dihydrate method, as well as increase in the extent of utilization of P_2O_5 from raw materials. The process of converting various phosphorites to wet-process phosphoric acid by the dihydrate method has been optimized. Methods have been devised of deriving wet-process phosphoric acid from poor phosphorites containing 28-30 percent P_2O_5 and more than 5 percent carbonates by the dihydrate and semi-dihydrate methods. These methods expand the raw materials base for such production.

Methods of producing new forms of fertilizers containing phosphorus (calcium and calcium-potassium polyphosphates) have been elaborated and tested under semi-commercial conditions. A method of manufacturing superphosphate-phosphorite fertilizer has been developed and applied in practice, yielding a significant economic effect. This method permits fuller satisfaction of agricultural requirements for phosphate fertilizers at lower production cost. An efficient technology has been worked out for production of phosphate fertilizers with a lower consumption of phosphoric acid and with variable ratios of the assimilable forms of P_2O_5 . To facilitate solution of the phosphate fertilizer problem, a method of granulating phosphorites and of producing double superphosphate with microelements has been developed in Bulgaria.

An improved technology for dicalcium phosphate production and a new technology for manufacture of carbamide phosphate for livestock raising needs have been successfully tested under industrial conditions.

Original technologies have been elaborated for making complex fertilizers through decomposition of phosphorite with phosphoric acid in the presence of ammonium nitrate, for complex fertilizers with slow-acting forms of nitrogen based on phosphorite, phosphoric acid, carbamide and Formalin, for deriving complex polymer fertilizers based on ammonium phosphates, carbamide, and Formalin, and for obtaining complex organo-mineral fertilizers. A technology for improving the physical and mechanical properties of complex nitrophosphate fertilizers has been evolved and tested under industrial conditions. An industrial plant has been built for this purpose, but the plant is not in operation because production of complex fertilizers has been suspended. The plant could be used to good effect for conditioning stabilized ammonium nitrate.

New technologies have been developed for making highly concentrated NP and NPK fertilizers (in the form of suspensions) based on wet-process phosphoric acid and for liquid complex fertilizers for leaf nutrition. Industrial production of a complex liquid fertilizer for leaf nutrition (Fiksal) containing macroelements and microelements has been organized.

Bulgaria has achieved noteworthy success in development of the artificial fertilizer industry. But such development poses a number of serious problems calling for solution by scientists of the Bulgarian Academy of Sciences, institutes of higher education, and government agencies and by the

specialists of applied engineering organizations and industry. They are problems associated with lowering costs of materials and energy resources, reducing environmental pollution by creating effective waste disposal technologies and radically new waste-free technologies for fertilizer manufacture, and improvement in the quality and broadening of the assortment of fertilizers with new and more efficient types and forms.

6115

CSO: 2202/20

EAST EUROPE/ELECTRICAL SYSTEMS

NEW POLISH FIELD TELEPHONE DESCRIBED

Warsaw WOJSKOWY PRZEGLAD TECHNICZNY in Polish No 1, 86 pp 9-10

[Article by Major Edmund Wirkus, MSc (Eng): "Telephone Set AP-82"]

[Text] Years of Polish experience with the manufacturing of desk-top telephones, technological progress in various fields, army demand for and the relatively high prices of imported telephone sets have all led to the development of a new field telephone set AP-82. This piece of equipment meets the military, mechanical and climatic requirements, meaning that it is adapted for operation in difficult conditions. It is based on new design solutions which improve its technological and operational qualities.

The field telephone set AP-82 is intended for direct and multiple telephone communication by wire and also for radio communications and radio lines. It is an inductor telephone suitable for operation with an arbitrary local-battery telephone set with inductor coils, for operation in an arbitrary local-battery telephone exchange system with inductor calling and in an arbitrary central-battery telephone exchange system, as well as for remote control of radio stations and as equipment for telephone-control stations. The unit can also be used at telephone switchboards with acoustic amplifiers and other telecommunication equipment.

The telephone set has the following parameters:

- powered by direct current 3 to 4.5 V from three R20 batteries or three KRS-35/62 storage batteries, or by 12 V current fed from outside (with batteries removed from the set);
- surmounted attenuation in the speech tract on frequency 800 Hz: 44 dB, which is sufficient for reliable telephone communication at a distance of some 25 km (PKL cable) or about 40 km (PKA cable);
- expressivity of syllables (logatons) when operating over an artificial line with 44 dB attenuation with an acoustic noise background at the level of 76 dB: 50 percent;
- the sound level of acoustic call signal in operation of two telephone sets connected by an artificial line of attenuation of 44 dB: 80 dB.
- the inductor power measured at a load of 1000 Ω and 200 revolutions of the handle per minute: 2.2 W;

--volume: 3.5 dcm²;
--weight without power source: 3 kg;
--operating temperature: from -40 to +50°C.

The unit is waterproof. The power source is switched on and off by the receiver hook. The unit consists of the receiver, mounting plate and housing.

The receiver contains microphone MM217S, earpiece W66S, switch with contact-tronic relays ZM107 and microphone amplifier built as the hybrid device HLY1310R.

The microphone inset MM217S is a differential electromagnetic electroacoustic converter. It features a high resistivity to noise interference: Its sensitivity to sounds originating from distant sources is low, while sensitivity to nearby sources (mouth) is high. This characteristic is provided by the exposure of both sides of the membrane to sound waves.

The placement of microphone amplifier inside the receiver makes it possible to attain the adequate signal/noise ratio, which is essential, because in microphone coils an electromotive force (EMF) arises of several tens of millivolts and the length of the microphone cord (which is the receiver of electromagnetic interference) is about 150 cm.

The receiver switch with the contact-tronic relays activates the power supply to the transmitter tract (of the microphone amplifier HLY1310R and transistor amplifier T1 to T4) only during the transmission of messages; in addition, it allows remote control of a radio station by closing the power circuit of transmitter, switching it from reception to transmission and vice versa.

The earpiece W66S is a dynamic electroacoustical converter of a high sensitivity and a relatively flat transfer characteristic.

The mounting plate is a printed circuit plate attached to the bottom of the equipment housing. It carries most of the electronic subassemblies and components.

AP-82 unit, like most field and desk-top telephones, has an antilocal system which largely reduces the speaker's voice as heard through the earpiece. The antilocality characteristic is achieved by using Wheatstone's bridge; its shoulders comprise windings 1-2 and 3-4 of Tr1 transformer, the impedance of the line with line capacitor C1 and bridge equivalent--R4, R5, R6, C3 and C4.

The generator of alternating current is the microphone, which through the amplifier HLY1310R and transistor amplifier is connected into the primary winding (5-8) of the transformer Tr1.

The earpiece W66S with the antistatic circuit (diodes D1 and D2) is connected into the diagonal of Wheatstone's bridge. In case of bridge equilibrium, i.e., when the impedance of line equivalent is equal to the impedance of the line

with the capacitor C1, no current flows through the earpiece, so that during the transmission the speaker does not hear his own voice or interference noise. In reality, because of the changes in line impedance, this condition can only be met to a certain degree, so that perfect antilocality can not always be achieved.

The function of call receiver is performed by a Meissner generator built on T5 transistor and transformer Tr2 together with earpiece W66S. The received call signal, after rectification by Graetz device (D6 to D9), is the source feeding transistor T5 and activating the generator, which produces in the earpiece the signal calling for the operator to service the device.

The telephone AP-82 has a number of electrical protection features which make it safe for operators and protect it against damage that can be caused by overvoltage on line contacts. Dischargers OG1 and OG2 with switch Z (connecting the set to the ground wire) protect the equipment and the operator from high voltages arising in the telephone line wires as a result of atmospheric discharges and in cases of damage to high voltage overhead lines. The circuit EPZ2 180 V protects the equipment from crossing with 220 V voltage power lines. It is a self-regenerating circuit, meaning that the connection with the power voltage does not damage either the circuit or the telephone set. Diodes D4 and D5 protect the semiconductor elements of the speaker circuit from voltage surges at a level where the dischargers are not yet activated.

The telephone AP-82 can be powered from an outside direct current source of 12 V, which is reduced to 4.5 V through a series diode-transistor stabilization circuit (T6, D13). This additional power supply option is intended primarily for units used permanently at exchange stations, most of which are powered from 12 V supply grids.

The housing is made of a plastic material (itamid 353T) of a khaki color providing protection from mechanical damage.

The inductor with permanent magnet used in the telephone generates sufficient power despite its small size. Its mechanisms are made of a material with low linear and volume expansion factors, ensuring proper functioning in a broad temperature range.

9922

CSO: 2602/34

EAST EUROPE/METALLURGICAL INDUSTRIES

HUNGARIAN ALUMINUM TRUST EFFORTS TO STAY FINANCIALLY AFLOAT

Budapest OTLET in Hungarian No 14, 3 Apr 86 p 15

[Text] While we have been slowly getting used to the fact that enterprises can go bankrupt and certain sectors of industry can get in serious trouble also in Hungary, it appeared that the Hungarian aluminum industry is the only one capable of getting through the difficult years without serious blood loss. During the 1970's, this sector was developing steadily based not only on the apparently secure Soviet-Hungarian aluminum agreement and the mixed domestic market but also on the rightly deserved capitalist market where our aluminum industrial products fetched good prices from customers and financially reliable buyers.

World market prices peaked in 1980 when a ton of aluminum raw material was still posted for \$2200 on the London exchange and our aluminum industrial products could also be sold for a good price in the actual market. Depending on price fluctuations on the world market, the aluminum industry earned positive balances ranging between \$100-200 million each year while domestic demands and obligations assumed toward the socialist countries were also met by the sector.

Managers of the Hungarian Aluminum Industrial Trust, MAT in short, were clearly filled with considerable pride and were hoping for a chance to repeat the 3-3.5 billion forint earnings between 1978 and 1980 while having undergone extensive development financed by considerable state loans during the past 10 years. In 10 years, 20 billion forints were spent on investments--with the approval of state officials--in the hope that the 3-3.5 billion will cover not only significant wage increases but also loan repayments and interest payments. The trend in the world market prices of aluminum supported these projections.

Of course, they did not count on such a rapid drop in the high prices; between 1980 and 1982, the peak of aluminum prices fell from \$2200 to \$880. This lowered our profits, of course, while the conditions under which the investment loans were assumed were changed resulting in increasingly higher payment obligations.

In spite of considerable state and price support, even the large capitalist monopolies could only weather the consequences of the fall in prices by

closing down some of their plants, which resulted in a 30 to 40 percent decrease in their capacity. The MAT was not compelled to do so, moreover, it made a profit of 1 billion forints in 1982 at a time when most of the global companies were still having deficits. It was utilizing 95 percent of its aluminum oxide-producing capacity and 100 percent of its metal producing capacity, and its products did not go to warehouses but to secure markets. In spite of the impressive numbers, the MAT was in a difficult position.

With the massive loan obligations and unrealized profits, it could not dream of living up to the lofty expectations because it did not have sufficient sources for its intended development. Nevertheless, the Seventh Five-Year-Plan for the national economy is counting on the production of 120,000 to 130,000 tons for domestic consumption, 24,000 tons of semiprocessed goods for export to the socialist market and 40,000 tons for export to capitalist countries.

Because further development of the Hungarian aluminum industry is in the interest of the people's economy, at the end of last year the State Planning Committee resolved that it is an important task to protect the functioning and competitiveness of the sector and to establish its credit worthiness in accordance with the goals and possibilities of the Seventh Five-Year Economic Plan. Accordingly, the resolution relieved the state loan debts of the MAT and rescheduled the bank loans whereby, in addition to enabling the MAT to meet its commitments, it was also provided, from a central source, with a significant part of the 6.7 billion forints for development needed between 1986 and 1988. In the opinion of the National Planning Office, the additional funds needed to accomplish the new developments started during the Seventh Five-Year-Plan period must be generated by the MAT on its own, under general conditions. The basic condition--creditworthiness--is assured with central support and it is up to the trust to decide how and to what extent it can utilize the possible sources for the particular developmental goals.

Changes in the Free Market Aluminum Price at the London Metal Exchange
(pound/ton)

1980:	1772.37
1981:	1274.97
1982:	998.10
1983:	1447.78
1984:	1312.06
1985:	1090.79

The MAT values the possibilities for development, even if on a more modest scale than the earlier ones, but it adds that its developmental sources are inadequate if real competitiveness is to be retained. World market prices are expected to increase modestly, the expanding Soviet-Hungarian aluminum industrial agreement is accompanied by increasing commitments, and a more rapid development of this industrial sector would be needed if it is to meet all these demands.

However, current possibilities are inadequate for such rapid development. It suffices to refer to the characteristics of the aluminum industry. They must get to the bauxite pocket deep in the ground, requiring either the purchase of costly drilling equipment or hiring someone else to do the work which is becoming increasingly more costly. The developmental resources must finance all of this and the construction of the closed-system containers used to store red clay, a considerable byproduct of aluminum oxide production. (From the annual yield of 2.5 million tons of bauxite, nearly 900,000 tons of aluminum oxide are produced yielding about 1.6 million tons of red clay which, because of its chemical content, cannot be returned to the soil and has to be stored in containers.) Thus the containers costing several million forints are not part of development although they deplete the resources intended for it.

Metallurgy is another big headache for the aluminum industry because the 30 to 40 year old aluminum foundries are outdated, the working conditions are bad and their reconstruction is definitely needed if at least the existing number of workers is to be retained. Namely, the working conditions for the employees have turned relatively worse during the past years.

In the foundries, there is need for gas suction systems and for mechanization of the aluminum oxide feeding. These will improve the working conditions but such investment is not accompanied by increased productivity. Therefore, the resources available to the MAT during the next three years are at best merely enough to maintain current levels--they say at the MAT. But they are not enough for fulfilling the obligations beyond domestic requirements, assumed by the expanding Soviet-Hungarian agreement while also increasing export to capitalist markets. On the other hand, the National Planning Office maintains that, in the interest of strengthening MAT's economic situation, the most important tasks are--while maintaining the current base level of production--the most economical utilization of the excess raw metal resource derived from the Soviet-Hungarian agreement and the more productive marketing of highly processed modern products in order to improve the MAT's profitability.

2473/9190

CSO: 2502/32

EAST EUROPE/MICROELECTRONICS

CSSR DIGITAL COMMUNICATIONS DEVELOPMENT DISCUSSED

Prague TELEKOMUNIKACE in Czech No 3, 1986 pp 38-41

[Article by Eng Emanuel Prager, CSc, of the Tesla Research Institute for Telecommunications: "Development of Digital Communications Systems in the CSSR"]

[Text] In order to ensure the acquisition of modern digital communications systems, development in the CSSR is mainly oriented toward cooperation in joint efforts within CEMA in the development of a unified communications system. The CSSR is participating in a number of projects in this development and expects that the results of this development will help to support an overall initiative in production in this field and also modern communications systems for the Czechoslovak communications network and for export as well.

An integral part of these projects is also the actual development of the system for medium-capacity exchanges for Czechoslovak communications, designated JSPST-N, utilizing the principles of digital communications as well as making use of the domestic component base. The overall concept of this system uses as a starting point the basic concept of the unified system decided upon within the CEMA framework, but in individual specifics this concept is affected by the domestic component base and the needs of the Czechoslovak communications network.

The development of this system is taking place in a cooperative effort of the development offices of Tesla-VUT (Research Institute for Telecommunications), Tesla Karlin, and Tesla Liptovsky Hradok and a prototype is being prepared for operational testing in communications in the years 1987 and 1988.

A summarized overall concept of this system is presented in this article.

Basic Concept of the Digital System

The basic concept starts with all modern principles used throughout the world and with the possibilities for future utilization, even in future integrated networks. The basic principles used in the development of this system can be summarized into the following points:

--Decentralization of control optimized from the standpoint of the system structure and operational needs.

--The use of digital communications principles makes possible future inclusion into integrated systems and leads as well to an overall advantageous solution for communicating both with speech and with other types of information.

--The utilization of modern microelectronic circuits contributes to an overall savings in space and to achieving the optimum structure of the system.

--The maximum use of diagnostics leads to simplified maintenance and repair of outages and to connecting in to a centralized system of monitoring and maintenance in the networks.

From the network standpoint, this system is supposed to make it possible to construct exchanges for the public network in various configurations, from the subexchanges through ancillary exchanges up to main exchanges with a capacity ranging up to about 6,000 connections. It will also be similarly designed for the construction of branch exchanges in the same capacity range. The goal is to develop a unified set of modules which can be put together in designs which will provide all of the types of exchanges mentioned above. The exchange concept also does not exclude the possibility of any further necessary expansion of the maximum capacity, if this proves to be effective in further development. In Figure 1, the basic possibilities for application of the proposed communications system are shown.

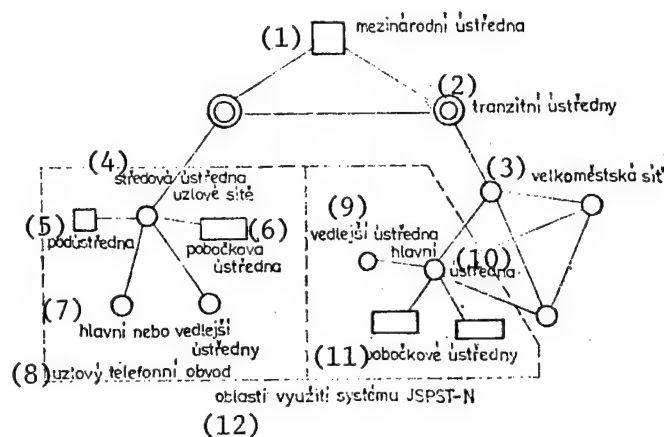


Figure 1. Basic possibilities for application of the JSPST-N digital system

Key:

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|--|--|
| 1. International exchange | 7. Main or ancillary exchange |
| 2. Transit exchange | 8. Nodal telephone circuit |
| 3. Large urban network | 9. Ancillary exchange |
| 4. Medium-capacity exchange of nodal network | 10. Main exchange |
| 5. Subexchange | 11. Branch exchange |
| 6. Branch exchange | 12. Area of JSPST-N system utilization |

From the standpoint of network application, the system is designed for cooperation on analog and digital lines with the current exchanges of the Czechoslovak network with the types of signals in use. Of course, part of the system is to resolve the centralized method of signal generation on the principle of No 7 type signals as recommended by the CCITT for cooperation in digital networks.

In its design, the system makes it possible in the future to hook up into integrated networks as well and it therefore from that standpoint, and also from the standpoint of further supplementing services, is actually an open system. It also makes it possible in the future to connect digital subscriber lines with 64 kbit/s transmission and thus to expand the services for the individual subscriber.

In utilizing these basic principles, the system structure shown in Figure 2 was proposed. The communications system consists of both so-called peripheral modules serving to connect up the lines and centralized modules containing the common equipment of the exchange for signal generation, maintenance, auxiliary control functions, etc. All modules are connected to each other in the digital communications domain, through which all communications pass, along with the control channels for interworking of the decentralized control units.

The peripheral modules form the basic boundary between the digital communications domain and the individual types of lines, analog and digital (subscriber and communications). At their input they are connected to the lines and at the output of these modules they are all switched over to a unified multiplexed PCM trunk for 32 channels (according to the CCITT). Thus there is created a unified boundary in the direction of the communications domain so that it is then possible to connect various types of peripheral modules in any given combination to the communications domain and thus to create the various types of exchanges from the local through the local combined with an interurban section up to the interurban. The communications domain, which connects together only PCM trunks, remains unchanged in all this.

Of the peripheral modules, one can pick out as most important the module for connecting the analog subscriber lines, which by its design today influences to a large degree the main parameters of the communications system. This module is also the most numerous module in the exchange and its design therefore affects the space parameters for the exchange and the overall economy of the communications system, as well as its structure (including the structure of the software). We therefore pay close attention, as do all other world companies, to the economies of the overall design of this module. At the current time, the module serves to connect up the subscriber lines, which are almost 100 percent to be found in the telephone network and which cannot be immediately changed over to digital. Of course, for the future it is predicted that the changeover of an analog signal to a digital one will gradually take place in the telephone instrument (the subscriber terminal), especially from the standpoint of expanding the functional possibilities of that subscriber terminal.

Putting the analog-digital transformer into the telephone instrument does complicate the design of that instrument, but on the other hand it forms a transmission channel between the instrument and the exchange with a transmission speed of 64 kbit/s, which can also be used for data transmission, alternatively with telephone conversations, or with its further expansion (for example, to 80 kbit/s) even for simultaneous transmission of speech and data. In the future it will thus be necessary to anticipate the connecting up of such digital telephone connections as well and therefore the appropriate module for them has also been developed.

The situation with the modules for connecting the communications lines is similar, as they are currently predominately analog. To connect them into the common digital communications domain, it is therefore necessary to create a module in which the analog-digital transformation takes place in addition to an evaluation of the signal generation. A gradual transition to the use of the PCM digital transmission system in the network, to which the development of these exchanges will definitely contribute to a great degree, will have to make use of another type of module which will not carry out the analog-digital changeover, but will serve to adjust the line parameters to the exchange, to provide synchronization, and to change the line signal structure over to that of the exchange. The development of these modules for connecting in the digital communications systems will take place more rapidly than that of the subscriber modules, and it is to be expected that these modules will be installed to a large degree in the first exchanges of this type.

The basic structure of the peripheral modules is similar. The modules work together with the analog environment (the subscriber and communications lines) and have the principal structure shown in Figure 3. They are made up of circuits in the analog boundary, the transformation of the analog signal to digital, the circuits of the boundary into the communications domain, control units, a communications processor, and auxiliary units serving signal generation or other purposes.

While the majority of these circuits are similar, the circuits of the boundary to the analog lines differ greatly from each other since they are basically different for subscriber lines and for communications lines and among these there are still other differences depending on the type of signal generation used.

The digital line modules (subscriber or communications) also have mutually similar structures. In addition to their own line termination circuits of the boundary to the lines, they are mostly also provided with synchronization circuits and other circuits of the boundary to the exchange, control units, and auxiliary circuits.

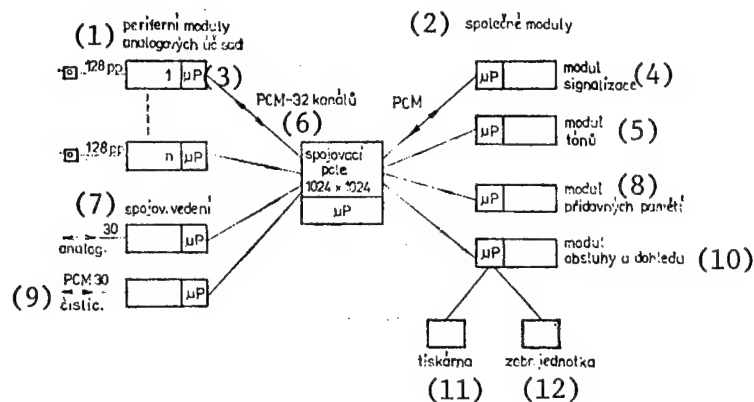


Figure 2. Bloc diagram of the JSPST-N digital system

Key:

- | | |
|--|-----------------------------------|
| 1. Peripheral modules of the analog subscriber equipment | 7. Communications lines |
| 2. Common modules | 8. Additional memory module |
| 3. PCM-32 channels | 9. Digital |
| 4. Signal generator module | 10. Service and monitoring module |
| 5. Tone module | 11. Printer |
| 6. Communications domain | 12. Display screen unit |

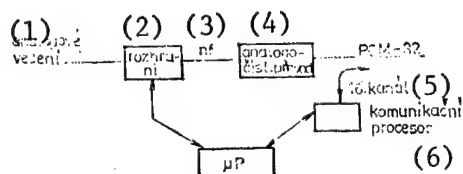


Figure 3. Basic structure of the peripheral modules

Key:

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|------------------|--------------------------------|
| 1. Analog line | 4. Analog to digital converter |
| 2. Boundary | 5. Channel 16 |
| 3. Low-frequency | 6. Communications processor |

Of the common modules of the exchange, we can name at least the main ones:

The digital communications domain which serves to connect up the digital PCM trunks (for the signal capacity of 32 PCM digital trunks, that is, 1,024 channels). In its structure, it is a standard T link in which the actual connection takes place in the call memory controlled by the control memory which works together with the decentralized control system (Figure 4).

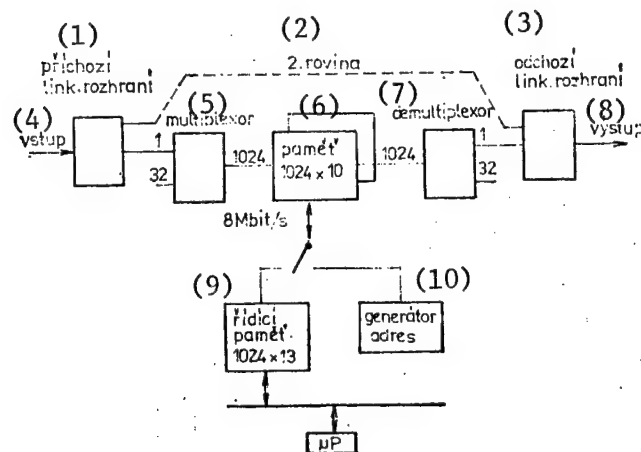


Figure 4. Basic bloc diagram of the digital communications domain

Key:

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|----------------------------|-----------------------|
| 1. Line arrival boundary | 6. Memory |
| 2. Second level | 7. Demultiplexer |
| 3. Line departure boundary | 8. Output |
| 4. Input | 9. Control memory |
| 5. Multiplexer | 10. Address generator |

The call memory works with a frequency of 8,096 Mbit/s and with 1,024 time positions. The call memory is duplicated and both parts work alternatively so that if one of them writes information, the other reads the information. The communications domain with the input multiplexers and the demultiplexers is also duplicated and actually two levels are created for reasons of ensuring reliable operations. Both levels are connected to the line arrival and departure boundaries, which control the conformity of operations of both levels or, as necessary, switches operations over to just one level. Despite the fact that the arriving channel information is eight-bit, work is performed in the communications domain with 10 bits, one parity bit being added along with one selection bit to designate the level from which the code group of the channel is to be taken.

The signal generation module contains the code receiver and transmitter for today's common type of multifrequency signal generation added to the speech channels. These modules can be general purpose ones for various types of signal generation, such as mfc pulse or controlled (R2 code), CCITT system No 5, CCITT No 4 signal generation, etc. From the standpoint of evaluation, this universal application results from the module's program control. From the standpoint of the method of transmission and reception of the actual signal generation frequencies and their combinations, the universal nature is dependent on the method of the actual generation and evaluation of the signal frequencies. As far as we are dealing with conventional receivers, this universality is limited, but where modern digital methods are used for evaluation of the signals, the universality can be greater from that standpoint. In this field, this module will eventually be developed in accordance with the development of micro-electronics.

From the standpoint of signal generation, the important module is the module for centralized signal generation of the CCITT No 7 type. In regard to the fact that this signal is not connected in any way to the speech circuits, but rather in a centralized manner to a given direction of communications, it is advantageous to centralize it into a unified special module. This module will at this time be rarely utilized in existing networks because its importance arises only when there has been an expansion of digital networks and digital communications equipment.

The common modules also include the modules generating the necessary signal tones for information on the way communications are running and the modules generating timing and synchronization signals for ensuring synchronous operation of the exchanges and, in the future, also networks. The module for generating tonal signalling in the future can be in accordance with the developments in microelectronics and speech synthesis eventually switched over to partially speech signalling (voices) in networks where it will be advantageous.

The control of the system is fully decentralized and a single level. Individual modules exchange information back and forth without the intervention or coordination of control elements at a higher level. Even modules whose function is to ensure common working by exchanges and contact with maintenance cooperate with others on the same level.

The control of the exchanges is divided up into control units in individual modules and in addition the control system includes some common modules such as the service and monitoring module, which provides communications with maintenance personnel over standard peripherals (a display screen unit with keyboard, teletype, printers, etc.) and also additional memory modules for storing data for the entire exchange and operational information, modules for control of the exchange of control information, etc.

An important property of decentralized control with its greater number of control microcomputers is their communication with one another. This can take place in various manners by common paths, by specially allocated channels, by speech paths, etc. In digital systems, most use transmission over PCM channel 16, which is not utilized for speech information. The exchange of control information in the system being described is expected to take place in the same manner also (Figure 5).

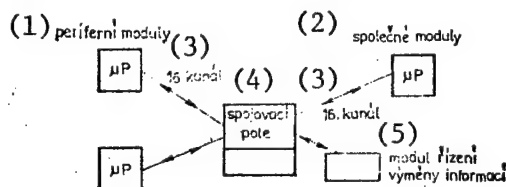


Figure 5. The exchange of control information in the system

Key:

- | | |
|-----------------------|---|
| 1. Peripheral modules | 4. Communications domain |
| 2. Common modules | 5. Module for control of information exchange |
| 3. Channel 16 | |

The overall process of controlling the communications system thus is broken down into partial sections (program modules) in which the control process of one module is worked out and after the operation is finished, there is a message addressed to another module generated in the module. The message is sent in channel 16 and in the central communications domain or a supplemental domain it is connected into the control of the module of the addressee. According to the address and other message designators, the message is then decoded and initiates an operation in the second module. In this manner, the establishment of communications takes place in the entire exchange by progressive cooperation of a number of modules. Some of these do not even have a partial function to perform, but just provide the calling module with various information and data.

The basic control unit of all the modules uses the standard 8-bit 8080 microprocessor. This is the standard microcomputer connection which can be supplemented as well by a preprocessing microcomputer to provide for some repetitious simple routine functions, such as determining the status of the lines, etc. In addition, the control unit is augmented by a communications microprocessor section for providing communications between modules via channel 16.

The control unit consists of several boards containing the basic microprocessor and a communications section, memory boards, and the boards of the preprocessing microprocessor. The contact circuits are component parts of the individual circuits of the module. All boards are connected by a common collection point.

The basic memory arrangement is calculated on an EPROM of 32 K capacity and a RAM memory of 64 K capacity (Figure 6).

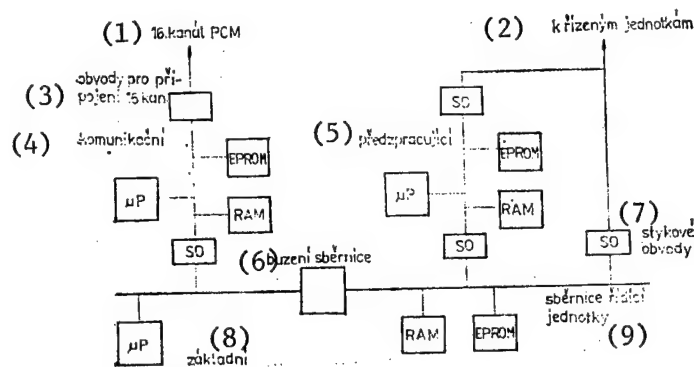


Figure 6. Arrangement of the control unit of the modules

Key:

- | | |
|--|--|
| 1. PCM channel 16 | 6. Collection point signalling |
| 2. To the controlled units | 7. Interface circuits |
| 3. Circuits for connecting in channel 16 | 8. Basic |
| 4. Communications | 9. Collection point for controlled units |
| 5. Preprocessing | |

Component Usage

A digital communications system starts off in its design from a modern microelectronics component base. Generally, it can be said that the microelectronics elements themselves made it possible to put together economically today's type of digital communications systems.

The use of microelectronics components in this digital communications system can substantially be divided into two basic groups:

- standard components, and
- special components.

Of the standard components, these are primarily microprocessors, integrated memories, and other microprocessor circuits. At the current time, the system uses an 8-bit control microcomputer based on the 8080 microprocessor architecture. In the memories of these control microcomputers, integrated circuits are used with a capacity of 16 kbit such as RAM memory and for programmable memory of the integrated circuits with an 8 kbit memory capacity. Progressively in the future there will be consideration of the use of memory with greater capacity on the chip, which will make it possible not only to reduce the dimensions of the control microcomputer, but also to increase its reliability.

In the future, we also expect to see a gradual changeover to a control microcomputer with an 8086-type 16-bit microprocessor, which would make it possible to further reduce the dimensions of the control unit and at the same time to increase the control capabilities. The 16-bit microprocessors and the appropriate microprocessor circuits are gradually being put into production in the CSSR and some of them, for example, the actual microprocessor, will be imported from the Soviet Union.

For all these standard microelectronic circuits, greater reliability is expected, especially for the memory, which in terms of its numbers and connection into the central control elements has quite an influence on the resultant system reliability. For these circuits, a failure rate of 10^{-7} or greater is desired.

In the field of special (custom ordered) microelectronic circuits, there will be use mainly of circuits for the boundaries of the analog subscriber or communication lines which at the actual boundary provide also for the change of the analog signal over to digital.

These circuits include:

- Integrated coder-decoders transforming the analog signal to a PCM signal (in both directions of transmission).
- The integrated filter which adjusts (limits) the input signal at low frequencies for its proper coding in the direction of transmission and ensures equalization of the signal after decoding to the low-frequency output signal.

--The subscriber boundary circuit called SLIC which provides for both working together with the subscriber line and also the transformation of 2-wire connections to 4-wire.

These basic circuits must understandably be augmented with several more auxiliary circuits for generating the reference voltage, for assigning channels, for limiting input voltage, etc.

All these special circuits are being put into production in the CSSR and will be manufactured both in CMOS technology and in bipolar technology (SLIC circuit).

These special circuits themselves determine the technical level of the design of the digital communications system. The fact that they are connected to every subscriber input (individual coder-decoders are used instead of the group ones used, for example, in the E10 system) means that the number of such circuits needed is relatively large. The parameters of these circuits thus determine the basic parameters of the system. The properties of the coder-decoder and filter are decisive for the overall PCM signal transmission in the system and the properties of the SLIC circuit determine the possibilities of meeting the communications requirements for the range and voltage loading of the subscriber line.

The circuits which are used in the digital communications system are up to the global standards for today in that field. But so far there is a certain shortcoming in the fact that the actual SLIC circuit connected directly to the subscriber line because of their technological set-up do not make it simple to work with 60 V power, but only with 48 V. Even this is up to today's global standard. In the further development of this circuit, the question of a possible increase in the power voltage will be studied.

In designing the electronic subscribers' equipment, the main problem continues to be the transmission of the ringing current, which reaches 150 V with prolonged direct current loading. In the current arrangement of the SLIC circuit, which can take a maximum voltage of 56 V, it is therefore necessary to use a relay for transmitting the ringing current. In this system, a miniature relay with two switches is used which makes it possible to connect it to a board with surface connections. This relay is also used for connecting in the subscriber line to the common testing terminal.

An important circuit in the subscriber assembly is also the protection against voltage surges occurring on the line. It uses a bridge connection of diodes which form an actual so-called secondary protection against excess voltages which are not suppressed by the primary protection on the main distribution lines.

From the standpoint of microelectronics applications, the communications domain is also an important part of the system, where today the leading companies in the world use special microelectronic circuits working, for example, with 256 channels. To date, such circuits are not being used in

the system for economic reasons. The number of them required overall is small and would not justify economic production of these complex integrated circuits. In addition, these special circuits can be replaced by micro-electronic memory. Of the other special circuits, hybrid circuits are also used for the filters of the code receivers and transmitters. With the passage of time, digital circuits will probably be used for evaluating the tonal signals and this will do away with the need for using these hybrid circuits.

There is an effort overall to maintain the maximum uniformity in the components of the JSPST system for both standard and special components as well. It may happen in the future that here, too, there will be a certain mutual influencing which can, for example, result in the use of special integrated circuits in the communications domain which will be used on a massive scale in the JSPST system.

An important prerequisite for the operation of the overall communications system is the maintenance of its reliability parameters, that is, primarily achieving a satisfactory median time between repairs. This requires a strict selection of components from the standpoint of reliability and in many cases it will be necessary to require the selection of components with a guaranteed reliability from the manufacturer.

Just as this digital communications system is an open one from the standpoint of future network applications and expansion of services, it is similarly designed from the standpoint of the use of components as well, so that in the future it will be possible to make a smooth transition over to more modern components with better functional and electrical parameters. In addition to the microelectronic components, this applies also to the constantly increasing level of integration of optical electronic components, where in the future there is consideration of switching over to, for example, optical electrical communications between the system modules with the necessary optical electrical transmission vehicles. In addition, for the transition to the use of digital subscriber lines, the system will need the development and production start-up of special circuits for the digital boundary to the subscriber lines and possible other circuits as well.

Synchronization

The synchronization of operations is an important matter for digital exchanges and networks. Work is performed at great speeds, the basic repetition frequency for transmission of a first-generation PCM signal is 2,048 KHz, and at the same time it is necessary to ensure synchronous operations between the units working together. Synchronous operations on independent PCM transmission trunks is provided by the so-called bit and frame synchronization. As far as working with PCM transmission within an independent exchange is concerned, where it deals only with analog lines in the network, the relationships are relatively simple and it is only necessary to ensure that all equipment in the exchange is synchronized from one timing generator, whose precision does not have to meet extreme requirements (an oscillator accuracy of 10^{-6} is sufficient).

If PCM lines are connected to the exchange, directly connected as a component part of the exchange, the digital exchange works in this transmission path as one of the terminal equipments of the PCM transmission line and must therefore ensure the previously mentioned bit and frame synchronization for the remote terminal equipment.

Problems come up only if there is another digital exchange or an entire digital network connected to the other end of a PCM transmission line, that is, if a larger network entity of a so-called integrated system is created. In such cases, the already common methods of synchronization described in the above paragraphs are not adequate and it is necessary to synchronize the entire network by new means so that deviations in the precision of the timing frequency are as small as possible. Otherwise, there occurs losses in the samples which become greater and more frequent the greater the deviation of the timing oscillators is in the individual portions of the network. These sample losses are not so substantial for the actual transmission of telephone conversations because speech transmission has sufficient redundancy, but are critical for data transmission. Since plans for the future include integration of services in these networks, that is, including data transmission, it is necessary to ensure great precision in the timing oscillators in all parts of the integrated network.

The CCITT has established a desired accuracy of 10^{-11} for digital integrated networks in international operations, which in itself (including time and temperature stability) can be achieved only with expensive atomic generators. An approach is therefore taken in such networks to synchronize the entire network from a master precision oscillator whose frequency for control of the timing oscillators in the individual exchanges can be transmitted either by an independent path, for example, by radio, or hierarchically over the transmission paths of the integrated system. In addition, it is necessary to ensure other means are available for mutually adjusting the oscillators in the individual exchanges.

From the facts given above, it can be seen that for the use of a digital system in independent exchanges with an analog environment (and this is the case today) or, in some cases, connected to digital PCM lines, the lower precision of control oscillators is adequate. But it is even today necessary to provide for such resources as would make it possible in the future to control these control oscillators from precision external oscillators and thus to ensure full network synchronization. Obviously, for the immediate future when only speech signals are being connected, it is possible to work in an asynchronous mode as well, which can also be the reserve mode for cases of difficulties with the basic precision oscillator, that is, external synchronization.

In the proposed system, synchronization is taken care of according to those principles.

Future Plans

Development of a small and medium capacity digital system is taking place and it will gradually be put into production in the basic application for public and branch exchanges. It will be possible to use it for exchanges which work in the analog environment.

For the future, augmentation of the necessary circuits for possible connection into an integrated network is expected, that is, primarily the circuits for network synchronization, equipment for centralized signal generation in the integrated network, modules for digital subscriber lines, and others, whose goal will be the creation of a component for the future integrated network from this system. The existing design will allow for this future expansion without any substantial modifications.

Resolution of the questions of cooperation in the integrated networks will be to a large degree dependent on the design for the JSPST unified system in working together on an international basis, since all these systems will have to work together in a unified integrated network.

Another future development of these systems will be the inclusion of more complex subscriber terminals whose use will make possible primarily the introduction of digital transmission along subscriber lines, as mentioned above.

Further gradual modernization of the system is also expected from the standpoint of the components base and expansion of the utilization of LSI integrated circuits, for example, in the communications domain and other equipment of the system in keeping with the development of micro-electronics in the CSSR and in the socialist countries.

It can thus be expected that the development of this digital communications system will make it possible in the future to meet all the future demands for implementing integrated networks both from the standpoint of transmission and from that of services.

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EAST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

POLICY ON HUNGARIAN LASER PRODUCTION QUESTIONABLE

Budapest IMPULZUS in Hungarian No 7, 5 Apr 86 pp 20-21

[Article by Gyorgy Szalai, Hungarian Optical Works: "Value Added"]

[Text] To avoid any misunderstanding, what follows is not an economics dissertation on "value added" that is embodied in industrial products. We may also discuss value added in a wider sense. In this case the question reads: Who can contribute to the value and marketing of new products, with what, and how? Specifically to the successful development and applications of laser technology.

We often hear of lasers, mostly foreign-made products rather than domestic ones. Domestic public interest in lasers has been aroused mainly by the preparations for star wars. In any event, the fact remains that lasers are incomparable to other device and instruments, already in two respects. First, their many types, modes of operation, designs and characteristic light emissions make lasers one of the few devices or perhaps the only device that covers several orders of magnitude in terms of its parameters (power, beam width, pulse time, etc.). Secondly, its areas of application are--figuratively speaking--separate and far apart. They include agriculture, medicine, the arts, computer technology, and we could go on and on with our list. The potential applications of lasers are unlimited in scientific research as well. We might say that its flexibility, in more ways than one, makes the laser an unprecedented device. In other words, the laser serves universal technical and technological progress.

How far has the world advanced in lasers? Much money is being spent on research and development, in the West and the East as well. Technological progress in this field is practically unlimited. Only the developed countries are able to offer a full range of lasers. Their commercial supply is broad and varied, applications-oriented. This is because the production of lasers is a high-tech industry requiring substantial investment, not to mention the costs of its basic and applied research.

According to the data supplied by Spectra Physics, one of the major manufacturers of lasers, world sales of lasers totaled 3.2 billion dollars in 1984. The breakdown of this sales volume by areas of application was as follows: materials processing, 30 percent; scientific research, 22 percent; medical instruments, 15 percent; regulation and control equipment, 4.5 percent; and

electronics equipment, about 28 percent. The growth rate of this last area of application is as high as 50 percent a year. The question is: What are our prospects in this international trade and among the competitors in this field?

As one of the managers responsible for development of lasers at MOM [Hungarian Optical Works], I find myself in a difficult situation when attempting to identify Hungary's place in the world or, more accurately, the rank of MOM as the only domestic large enterprise series-producing lasers.

Basic research in Hungary is conducted--in descending order--at institutes of the Hungarian Academy of Sciences, the academic universities, and industrial research laboratories, while implementation and related development take place in industry, at enterprises and perhaps smaller economic units.

So far as the value of this traditionally evolved and seemingly sensible "line-up" is concerned, permit me to note that these mutually interconnected efforts could be more fruitful if their results were taken into account more reasonably than usual. Obviously, there can be no progress without basic research, and every advance in basic research is of great value. From the viewpoint of marketing, however, implementation in industry of the devices coming from the laboratories requires development that is no less significant than the basic research; the task of development, so to speak, is to place the crown of implementation on all the preceding efforts.

This is not moot reasoning, because it has a close bearing on the structural solution of marketing lasers. In the advanced capitalist countries, development in most cases is not undertaken by large corporations; in other words, lasers are not burdened by the high overhead of such corporations. This solution would be feasible in Hungary as well, if infrastructural industry, skill and discipline in coproduction, and technical services were brought up to the desired high, modern standards.

Consider, for example, the relative shortage of R&D capacity at MOM and similar enterprises. MOM is attempting to bridge this capacity shortage by continually expanding its relations and cooperation with the research centers of the universities and the Hungarian Academy of Sciences. We are striving to utilize the research results as quickly as possible, and in practice we act as mutually reliable partners. We take cognizance of the fact that one of our very important tasks is to reproduce the laws of physics at the level of phenomena, but this cannot be the point where the innovation process ends. Because, as I have already mentioned, to bring some result in the technical sciences "to the production stage" requires not only serious creative effort, but suitable scientific training as well. Production requires also suitable organizational structures that link, coordinate and stimulate the research-development-production process. There is a domestic program for this, but--and this is true of other programs as well--its implementation is proceeding more slowly than what would be desirable, even though the results on which further progress can be based are available, making obvious the timeliness of the program's implementation.

Which are these results? Both Tungsram and MOM are engaged in the development and production of lasers. Tungsram developed a carbon-dioxide laser and is

planning to manufacture it independently. The KFKI [Physics Central Research Institute of the Hungarian Academy of Sciences] and MOM are bringing to market solid-state (Nd:YAG and Nd:phosphate glass) lasers on the basis of joint basic research and development. On the gas (He-Ne) and metal-vapor ion (He-Cd) lasers, the KFKI and MOM did the research; Budapest Technical University and MOM jointly undertook the development; and MOM is the manufacturer. Finally, on the N_2 + dye laser, the research is being done by JPTE [Janus Pannonius University, Pecs] and JATE [Attila Jozsef University, Szeged], while MOM is preparing to undertake the development and manufacturing.

As can be seen, the "structure" presents a fairly mixed picture, and our "lineup" could be more efficient. Specifically the significant results we have achieved within the present framework could provide a stronger impulse for making our "lineup" more efficient. However, we have also another motive if we ask ourselves: Could MOM or Tungsram support itself from lasers at least as well as it is supporting itself from its other products? Well, hardly under the present research-development-production structures.

If this is how we stand, then why are MOM and Tungsram making lasers anyhow? The answer is simple: the mentioned firms cannot afford not to make lasers. Because their production structures and presence in international markets make it imperative that they include among their products of world renown also lasers, which simultaneously generate--already now and more so in future--substantial import as well. Naturally, both enterprises are striving to select for production the types of lasers that can be series-produced, are competitive both at home and abroad, and are readily marketable. Lasers are used in medicine also in Hungary, as "laser scalpels" (Oncological Institute, military hospitals), in cosmetic treatment (the recent controversy this application has provoked was unwarranted), and in acupuncture (as "laser needles"). But these lasers are not enough for the MOM label. There is need also for special lasers, and we have indeed come out with some. The world sat up and took notice of the laser that the Physics Central Research Institute developed in collaboration with staff members of the Prokhorov Institute [General Physics Institute of the USSR Academy of Sciences] in Moscow, and with MOM as the possible manufacturer. This is the solid-state laser which also Academician Kroo praised recently in the press, and which we have built into an optical measuring instrument.

According to current usage, I would rate this future MOM product as an "outstanding product" that represents the "peak" of domestic technology. A peak, of course, is a relative concept. In the "hill country" of domestic technology, nevertheless, this product does stand out, and it deservedly assumes its place also among the front-runners of international research and development. But it is a peak also in the sense that it stood practically alone at the time of its appearance on the market.

So far as domestic users are concerned, laser technology must be reckoned with in the development of industrial technologies. It must be clearly understood that either import restrictions or embargoes prevent the importation of certain elements, devices and technologies; and that, due to the present conditions in the area of investments, there is not much chance of expanding with central resources the domestic supply of lasers. The only solutions seems to

be that we conduct basic research, and undertake the development of technologies and instruments, in certain specialized fields that are judged to be attainable, and mobilize for the solution of the task the international forces willing to enter into coproduction arrangements. This outlined path is warranted, partially because domestic research and industry provide an opportunity for it; and partially because--as we have seen--advances in laser technology are absolutely essential in Hungary as well.

In my opinion, the cause of our lag must be sought primarily in interest relations that are almost systematically unfavorable for the participants in the innovation process. The interest relations are unsuitable not only in the entire process itself, but in its individual phases (research, development, production, marketing) and rates as well. Namely, one of the conditions for coming out on schedule with new results, products, of the desired quality is that the creative individuals and the members of creative collectives (the manager, physicist, engineer, production engineer, technician and skilled worker) know their tasks from the very outset, and that they also know (and recognize) one another's contributions. For such integrated collectives it would be expedient to provide also direct, carefully designed, material incentives.

To my mind, the following question seems logical: Why has our decade-long deserved scientific position, our presence among the front-runners in international laser technology, not generated adequate financial rewards?

A typical answer is that this position in itself is not enough for a breakthrough, i.e., for market penetration. The material resources that the development of lasers, the basic and applied research and the product development, would require must be allocated to other spheres that enjoy priority.

However, a "breakthrough" is lacking in our domestic market as well. The R&D specialists at industrial enterprises are familiar with the advantages that laser technology offers; but they usually consider its application too expensive, despite the fact that they are constantly encountering the limitations which the absence of laser technology imposes--in precision machining, for example. But even so, the research that the universities are doing for domestic industry--this research involves mostly the solution of problems pertaining to design, technology or measuring techniques--indicates that lasers will spread sooner or later in our industrial practice as well. And for this to happen sooner rather than later, we should stop to consider the unutilized reserves for the overall operation of the enterprise wherever the application of laser technology in itself is judged too expensive. I am convinced that in this manner a way can be found to make the application of modern technologies, including laser technology, affordable after all. Because, in addition to MOM and Tungsram, also the other large and medium-size enterprises will be compelled sooner or later to hall-mark their products, among other things, by what place they have assigned to lasers in their production technology. Lasers increase the new value added.

All this is hardly debatable in principle. But as Lenard Pal, my one-time professor, pointed out in his essay that appeared in the January issue of IMPULZUS, those who live in the "thicket of creative activity" are able to grasp generally valid statements only in their own environment. Integrated

thinking is lacking, and in its place there prevails an intellectual attitude of waiting for one another.

This ties in also with the fact that our highest-level decisions and resolutions are generally good but, due to weak implementation, they are not carried out, or not at the rate and in the way that the generally applicable central intentions require. In my opinion, the cause of this lies to no small extent in the fact that not everyone who is in charge of some important link in the chain of innovation is qualified for good and consistent implementation. I myself have met very few people who, exercising proper self-criticism, have relinquished their task to somebody truly capable of solving it. Hence it follows that those who achieve outstanding R&D results must in the long run devote, commensurately with the magnitude of the task and its degree of difficulty, excessive personal effort that should not be expected of anyone, often at the expense of their private lives and families. But they are willing to make this sacrifice out of conviction, motivated by love of their profession, for the progress of science and technology, and ultimately of society as well. This, too, is "value added," of the most noble and valuable kind. But as we regrettably see from the imbalance of the great intellectual investment and the relatively meager economic return, not even a few swallows, let alone one, make a summer.

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EAST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

HUNGARY'S PROBLEMS OF IMPORT LICENSE PURCHASES AIRED

Budapest IMPULZUS in Hungarian No 7, 5 Apr 86 p 31

[Article by Laszlo Racz: "Dynamism and Problems"; first paragraph is IMPULZUS introduction]

[Text] Since 1980, industry accounts for between 90 and 95 percent of all the foreign licenses obtained by Hungary, and their costs amount to 10 or 11 percent of industry's total R&D outlays. This share was only 4 or 5 percent in 1968-1972. And although the number of enterprises using licenses has increased during the past decade, our international lag (see Table 1) is great, the time required for the adoption of foreign licenses is still too long, and we develop few of the licenses further. The OMF B [National Technical Development Commission] has prepared an analytical study of the situation and the problems.

Table 1. International Comparison of Hungary's Import of Licenses
(1978-1982 Data)

	Import of licenses in percent of		
	<u>R&D</u>	<u>Commodity import</u>	<u>GDP</u>
Netherlands	17.4	0.88	0.38
Norway	11.0	0.55	0.15
Belgium	17.2	0.43	0.20
Austria	13.8	0.57	0.18
Finland	13.4	0.53	0.14
Hungary	4.0	0.26	0.10

Source: "Experience of Acquiring and Using Foreign Licenses," an analytical study of the OMF B, 1984.

According to international experience, between 35 and 40 percent of the R&D outlays is for research, and between 60 and 65 percent is for development. While several thousand topics are researched, development affects only a few hundred. Thus the development cost of a single topic is one order of magnitude higher than the research cost of the same topic.

Approximately half of the research topics end with a result that can be implemented technically. But only every third or fourth among them will also gain market acceptance, as a profitably marketable new product or process. Thus the "failure rate" of technical development worldwide is high, around 90 percent.

Efforts are concentrated on the remaining 10 percent of the topics. Anyone who misses this opportunity will definitely fall behind in the worldwide contest of each nation's intellectuals.

Hungary obtains between 90 and 95 percent of its industrial licenses from advanced capitalist countries, half from the Federal Republic of Germany and the United States. The international practice that 70 to 85 percent of the foreign technical know-how is used in the two most research-intensive branches, engineering and the chemical industry, applies also to Hungary's import of licenses (see Table 2).

Table 2. Costs of Foreign Licenses in a Breakdown by Industries (Percent)

	<u>1976</u>	<u>1978</u>	<u>1980</u>	<u>1982</u>	<u>1984</u>
Mining industry	0.1	0.0	1.5	0.5	0.0
Electric power industry	0.0	0.5	0.4	0.3	1.5
Metallurgy	10.6	5.9	9.9	5.2	7.9
Engineering	68.2	63.4	59.2	68.5	54.6
Construction materials industry	7.1	3.3	2.7	0.5	2.3
Chemical industry	6.4	18.8	19.2	15.2	21.0
Light industry	3.0	3.0	2.7	6.1	6.4
Other industry	1.0	0.2	0.5	0.2	0.0
Food industry	3.6	4.9	3.9	2.8	6.3
Socialist industry jointly	100	100	100	100	100

Source: Ibid.

During the past 10 years, the number of industrial enterprises using licenses has increased more than 1.5-fold, but this is still only 12 to 14 percent of the number of economic units operating in industry. But once an enterprise gains favorable experience of licensing, it is willing to acquire additional licenses. The industrial enterprises that use licenses each have an average of three licenses. Chemical enterprises acquire the most licenses: six on average. This willingness to acquire licenses is reflected in the results as well.

The proportion of sales of products produced on the basis of foreign technical know-how is still relatively low within the operations of industrial enterprises. In 1982-1984, the proportion amounted to between 5.2 and 5.3 percent of total sales, in contrast with about 10 percent in the industrially advanced capitalist countries. In Hungarian practice, only two industries--the chemical industry (here, for example, sales of licensed products have more than trebled since 1975) and engineering--are able to report proportions of 8 to 10 percent.

The proportion of export sales within sales of licensed products has reached 35 to 40 percent during the past 10 years. This can be attributed primarily to the aforementioned two industries, where this proportion is 40 to 50 percent. So far as the breakdown by principal destinations is concerned, as late as 1977 the socialist countries' share of export sales was more than 80 percent. Thereafter the share of the licensed products' export denominated in capitalist currencies rose rapidly, and in 1984 it already exceeded 65 percent, half of it supplied by enterprises of the chemical industry.

The way this could come about was that export denominated in convertible currency trebled during these years, while socialist export dropped to about half.

In recent years, licensed products accounted for between 8 and 8.2 percent of the industrial enterprises' total export; and the share of export sales to capitalist countries was 74 percent in the chemical industry, 83 percent in light industry, and 93 percent in metallurgy.

Together with the results, there are problems as well. According to the data in Table 1, our lag is the greatest in terms of license costs as a percentage of R&D outlays. Higher proportions of outlays for licenses occur also in other countries, not included in the table. For example, 9 percent in Switzerland, 16 percent in Sweden, 20 percent in Denmark, and over 30 percent in Spain.

The long time it takes to obtain a license and start using it is likewise a problem. The combined total time required from the commencement of negotiations, through contracting and the introduction of production, to startup is 40 months on average. Add to this 3 or 4 years as the period of license selection, and the lag already increases to between 6 and 8 years. Experience shows that delays detract from the profitability of license-based investments that were judged favorable initially.

A significant proportion of the licenses obtained by Hungarian enterprises is not intended to advance domestic research and development, but as a substitute for it in areas where domestic research results are not available. At least this is the conclusion we may draw from the fact that only 15 percent of the obtained licenses undergo further development at home. Yet it is specifically through further development that the rapid obsolescence of foreign know-how could be offset, and the drawbacks of trailing development eliminated.

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EAST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

HUNGARIAN PHARMACEUTICAL PLANT OFFICIAL INTERVIEWED

Budapest IMPULZUS in Hungarian No 7, 5 Apr 86 p 25

[Interview with Dr Gabor Kovacs, chemical engineer, head of Chinoin's Pharmacochemical Main Department, by Laszlo Vatz; date, place, and occasion not given]

[Text] As the head of Chinoin's Pharmacochemical Main Department, Dr Gabor Kovacs directs industrial research.

[Question] What do you have to be first and foremost? Researcher or manager?

[Answer] I am a scientific manager. Basically I have to be a researcher. But as there are nearly 250 people working here, including many great research personalities of national renown, sometimes my duties could be compared to those of a theater director.

[Question] Have you worked here since the start of your career?

[Answer] I graduated in 1963 from Budapest Technical University's Faculty of Chemical Engineering and came straight here. As is customary for beginners at our enterprise, for a few years I managed a factory unit. It was a great experience that, on a six-month scholarship, I was able to study in the United States, under Professor Corey, at Harvard University's Department of Organic Chemistry.

[Question] In what kind of research did you participate there?

[Answer] Professor Corey is one of the world's most famous organic chemists. There were about 30 of us in his group at that time, half of us foreigners on scholarships. I was the first student on a scholarship from a socialist country. Professor Corey is credited with the first complete synthesis of many natural substances, including prostaglandins. My six-month scholarship was too short to enable me to participate in the program of experiments. I worked instead on the computer-assisted planning of syntheses, which was being pursued very intensively at the department. I found the systematic theoretical elaboration of organic chemistry very edifying.

[Question] Did the professor not mind that his results would be borrowed abroad?

[Answer] The research was funded by federal grants. In such cases the researcher cannot patent his results. Indeed, he must place them in the public domain. My relations with the professor have remained so good that since then two of my coworkers have received scholarships to study under him.

[Question] Going back to Chinoin, what assignment did you get upon your return from the United States?

[Answer] Within the enterprise, I managed one of the chemical research departments from 1971 on. Seven years later, I was placed in charge of the Main Department of Chemical Research. Three years ago, biological research and chemical research were integrated at our enterprise.

[Question] What is the role of this main department?

[Answer] One could call it also the preclinical main department. Basically we submit proposals for new products to the enterprise's research council. That is when the first important decision must be made affecting the fate of a potential future product.

[Question] How many years does it take for a chemical compound, already prepared and found suitable, to become a marketable pharmaceutical?

[Answer] We are now bringing to market compounds prepared in the early 1970's or even earlier. For this very reason we have to plan ahead a long time, at least 15 years.

[Question] Do you now have such new compounds of your own?

[Answer] During the past three years we have elaborated proposals for six original pharmaceutical products, and we hope that at least two of them will be registered, and one or the other will become a successful pharmaceutical.

[Question] Are these results related in any way with prostaglandin research, which has a wide range of applications?

[Answer] Yes. This has been one of our principal directions of research since 1970. Naturally, we first prepared prostaglandin, and later switched to its synthetic derivatives whose effect is more favorable. An indication of our success is the expressed intent of Japanese enterprises to obtain licenses for these derivatives.

[Question] In directing this work, do you not feel your lack of training in biology?

[Answer] I am convinced that the research methods in biology and in chemistry are essentially identical. Because of the rapid changes in the relevant body of knowledge, moreover, I find that self-education is more important than basic training. But the fact remains that the traditional preponderance of chemists at our factory is creating a problem. My real aim is to raise Chinoin's biological research to the same level as that of our chemical research.

[Question] Have you felt that your length of service here is a drawback? Have many of your coworkers left because of differences of opinion?

[Answer] That is not typical. Of course, there is a turnover in researchers everywhere. Also many researchers left the enterprise during its bad spell a few years ago. Speaking of personnel and the turnover, I recently read in your paper the debate on the situation of the technical intelligentsia. I have a comment or two to add on the problem of performance or recognition. The researcher in a small country starts out with many handicaps. For example, he must have a good knowledge of English. Furthermore, there are interruptions in the procurement of the professional literature, not to mention equipment and chemicals, which are mostly Western. In addition to talent, the Hungarian researcher must have enormous ambition to attain a high level. To achieve the same result, he must work much harder than his colleague in another country. And to this end he needs society's effective support. Here I have in mind scholarships, for example, and the researcher's livelihood in general. I am convinced that anyone driving a taxi as his second job, instead of doing research, will never become a researcher of any significance. This is why Hungarian participation in scientific research worldwide is modest.

[Question] Is Hungary's share of world research smaller than what our potential would warrant?

[Answer] On the whole it is in accord with the country's development. At the same time, Hungarian pharmaceutical research has achieved significant results. The world press, ranging from professional scientific publications to NEWSWEEK, has given wide coverage in recent years to Jumex, one of our pharmaceutical products, while the domestic mass media have hardly mentioned it. "Wonder drugs" are in the center of attention in our country, and this is causing great harm.

[Question] In your opinion, is there some sort of professional stronghold in pharmaceutical research that no outsider can penetrate?

[Answer] That, in my opinion, is not typical. But the chances are minimal that Aunt Julie will easily solve something the world's best scientists have been unable to solve. We get many letters recommending home remedies. But nobody believes us when we reply that in our tests, under strictly controlled conditions free of the placebo effect, the recommended remedy was ineffective. There is no other country in the world with so high expectations of wonder drugs. In Hungary even the economists tend to seek innovation shortcuts.

[Question] Are you content?

[Answer] I love my profession and mostly enjoy what I am doing. And I am pleased to read new scientific papers with as much curiosity as 23 years ago.

My wife, an analytical chemist, was a classmate at the university. My son, aged 21, is majoring in Hungarian and English, in Debrecen. I suspect that perhaps I am interested in too many things, from languages to music and computers. I play tennis regularly and row a lot. I am now preparing to defend my doctoral dissertation, on developing prostaglandin analogs into pharmaceuticals.

EAST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

IMPLEMENTATION OF COMMUNICATIONS REGULATIONS IN CSSR

Prague PTT REVUE in Czech No 6, Nov-Dec 85 pp 162-168

[Article by Doc Eng Ivan Laska, CSc, deputy minister of communications of the CSSR: "Fulfilling the Conclusions of the Eighth Plenum of the CPCZ Central Committee on Accelerated Application of Science and Technology in Practice"]

[Text] In connection with the conclusions of the Eighth Plenum of the CPCZ Central Committee on the problems connected with an accelerated application of R&D results in practice, the FMS [Federal Ministry of Communications] worked out a document titled Measures for Accelerated Application of R&D in Communications (hereafter referred to as Measures) and the minister of communications tasked all managers of communications organizations with further working it out for the specific conditions of the organization and with ensuring its implementation.

An evaluation of the status of fulfillment of the Measures for the period up to June 1985 was carried out in accordance with the political organizational measures of the FMS approved in 1983 and a consolidated report was submitted to the collegium of the minister, which in the discussions of 2 September 1985 expressed agreement with the report and with the proposed further approach as well. The purpose of this article is to pass on information on the status and fulfillment of the Measures and on the main problems and deficiencies which are having a negative effect on a broader and more rapid introduction of R&D results into communications operations. In order to make it easier to scan, the evaluation is broken down along the same lines as the Measures.

Planning and Management

Beginning in 1983, new principles and a new basis in the methodology was approved and implemented in the planning and management area of R&D:

--Applications outputs were thoroughly formulated for newly included departmental tasks in the R&D plan. A task implementor and, wherever possible, the primary user were designated for each applications output.

--In 1983, the principle of medium-range plans was approved for departmental TD [technical development] plans and within its framework the guideline was accepted that developmental tasks in the TUS [Communications Technical Center]

would not exceed a resolution period of 3 years. An agreement was made between the VUS [Communications Research Center] and the two URS's [possibly Communications Central Management] on supporting the new facilities of TUS for the Eighth 5-Year Plan.

--For the rationalization task of the URCS [as published, probably Central Council of Communications something], the principle of comprehensive task resolution was approved; for the years 1984-1985 a 2-year plan was worked out and tasks of rationalization of technical assistance to the communications organizations were introduced and are being utilized in practice.

--In the field of the invention and improvement movement, the procedures for handling so-called reserve improvement suggestions was rationalized.

Financing technical development directly to the communications organizations is also connected with the application of the new decree on R&D financing. The FMS is therefore preparing the appropriate departmental actions. An updating of the Directive on Setting Up and Operating Operational Laboratories has also been prepared.

The preparation and working out of proposals of the R&D plans are based on the 5-year plan in which the main tasks and applications outputs are contained. Problems have come up, and these are mainly in confirming the coordination plans for the state technical development plan tasks by the executory organizations of the FMEP [Federal Ministry of the Electrical Engineering Industry].

The publication of general and departmental methodological material on planning and management determines the form and unifies the methods of working out the plans, justifying the needs and effectiveness, etc. They thus form the prerequisites for accelerating the process of resolution and subsequent utilization in practice. But in this area the decisive role will be that of the decision-making collectives and the responsible management.

For the field of computer equipment and ASR [automatic control systems], the Concept for Constructing ASR in Communications up to 1995 was worked out and contains a specific option for further construction of ASR while respecting the future development of the communications branches along with objective limitations on the acquisition of new computer equipment.

Effective utilization of computer equipment has in the past been a priority task at all management levels. Lately there has been a favorable trend developing, especially in the indicator of productivity of computer utilization, which comprehensively characterizes the utilization as the product of the average values of shiftwork utilization, the coefficient of multiple operating modes, and a percentage of the productive utilization of the machine capacity. This indicator has proven itself and since 1982, when the value was 2, it had increased to 2.68 in 1984. The productive utilization of the machine capacity in 1984 reached a value of 79.74 percent, which is 1.14 percent more than in 1983.

There was less utilization of some computers for various reasons in 1984, for example, the SM 3-20 computer at the Bratislava TUS had 49 percent utilization

and the SM 3-20 at the Bratislava SDK [Administration for Long-Distance Cables] it was 24.8 percent. The SM 4-20 computer at the Prague SDK was not put into operation at all during 1984. The management of the FMS and the communications organizations have taken action on these cases.

In the communications department in the last few years there has been increased attention given to introducing minicomputer and microcomputer equipment. Microcomputers of Czechoslovak manufacture are being used in all main communications operations, such as, for example:

--in telecommunications, the SM 50/40 systems are utilized for automatic operations tracking of the long-haul telecommunications network,

--the SM 50/40 is used for constructing the telemechanized radio communications system, and

--in mail and PNS [Postal Newspaper Subscription Service] the SM 50/50 microcomputer will gradually be introduced for the selection, arrangement, and processing of data. The freely programmable NS-910 or NS-915 automatic sorters are used for sorting packages. The SAPI 1 computer will be utilized for the IPF 80/D machine which will work in the automatic mode (equipment for reading bar codes and equipment for automatic printing of groups).

In the field of microcomputer equipment, training was organized for supervisors and technical personnel.

Research

The following results were achieved in effective utilization of the departmental R&D base, international R&D cooperation, and the capabilities of the higher schools:

--the VUS directed its activities at reducing the period of problem resolution and accelerating utilization of results in communications operations; for example:

a) in connection with the development of equipment for testing centrals and lines, accelerated introduction of this equipment was achieved in cooperation with Karlin Tesla by means of an agreement negotiated between the VUS and the manufacturer which provides for special production of two sets of equipment before serial production begins, which will speed up operational use by 1 year;

b) close cooperation with Liptovsky Hradok Tesla in checking out the new types of electronic centrals UE 10 and UE 20 allowed us to complete certification of both types by midway in 1985, which thus created conditions for beginning production of these centrals already in 1986 and accelerated production by at least half a year;

c) in addition, the development, construction, and initiation of operations took place for a simulator of a broadcast satellite in the 12 GHz band. This is a one-of-a-kind piece of equipment whose importation was unsuccessfully

requested for 2 years from the NSZ [nonsocialist countries] (because of an embargo by the NSZ) and is required for the experimental verification of the individual parts of the receiver section of the system of broadcast satellite services. This was a savings in hard-currency foreign exchange of Kcs 1.8 million, for which the design team of VUS and Hloubetin Tesla employees were awarded with an exceptional SKVTRI [State Commission for Development and Coordination of Science and Technology-SKVT; RI as published] bonus.

--One can cite a number of good results from the work which the operational laboratories performed. These include primarily work on fire protection with the transmission of the central program of Soviet television, development of a control measuring device for VHF transmitters and a short-wave alarm (SR-P), the development and production of communications path switches for an automatic monitoring system (SDK-P), test operations and suggestions for improvement of the MAK equipment for pressure protection, construction of the test section of the transistorization of the LV-120 transmission equipment according to the submitted improvement proposal (SDK-B), and others.

--Close cooperation of the VUS efforts with the designers of new equipment development is provided for and KRB's [as published] were created to resolve the development and production of the satellite transmitter simulator and to ensure and speed up the verification of testing equipment for centrals and lines, as well as the creation of joint work teams to handle the development of the MPM pay phone equipment (TUS and VUS), the MAK-D test operations equipment (TUS-B, VUS, and SDK-B), and the development of the VTA equipment for automatic status checking (operational laboratory of the VsRS--probably East Slovakia Communications Directorate--and Stropkov Tesla).

For the period of the Eighth 5-Year Plan it will be useful to increase cooperation with the CVUT [Czech Institute of Technology], where it is necessary also to check out the possibilities of utilizing the design capacity and computer centers of the CVUT and to complete negotiations on participation in carrying out the tasks of the state technical development plan. But negotiations with some of the higher schools have shown up the limited capacity and other possibilities for participating in carrying out the communications tasks (SVST--Slovak Institute of Technology, the electrical engineering faculty in Bratislava, and the VUT [probably Telecommunications Research Institute] in Brno). Shortcomings have also showed up in completing the tasks on schedule (VSDS [probably Higher School of Long-Haul Communications] and the faculty of PEDAS) [as published].

In the interest of increasing cooperation with the CSAV [Czechoslovak Academy of Sciences] departments (especially the Institute of Radio Technology and Electronics) and based on discussions between the CSSR minister of communications and the chairman of the CSAV, an agreement was drawn up and then signed on 10 October 1985 which contains, among other things, the role of the communications departments in forecasting work carried out by the CSAV as directed by the CSSR government.

Development and Production of Communications Equipment

For accelerating the development of communications equipment and their introduction into production, the following steps were taken:

--In order to meet the needs of the communications department for supplies of products from the FMEP enterprises, on 4 June 1985 an agreement was signed between the CSSR minister of communications and the CSSR minister of the electrical engineering industry for the Eighth 5-Year Plan.

In negotiating the agreement, the FMS strove for a reduction in the timeframe of development and accelerated deliveries from the FMEP organizations. Among the successful results of development are the development of the equipment for testing centrals and lines (the ZZUV from TeKa [Tesla Karlin]), small branch centrals for 40 and 80 subscribers (UE 10 and UE 20 from TeLH [Tesla Liptovsky Hradok]), and equipment for testing circuits (ZZO from TeKo [Tesla probably Kolin]).

From a comparison of the number of items of developmental tasks taken on which are contained in the interdepartmental agreements of 1980 (24) and 1985 (37) can be seen the greater agreed-upon extent of developmental tasks for the Eighth 5-Year Plan, which is connected with, among other things, the justifiable demands of the communications department for a greater variety of equipment caused by the need to modernize the network and the development of current, as well as newly prepared, communications services.

The developmental tasks included in Appendix 1a of the agreement have, as a group, been carried out, even though in some cases there were delays of more than 1 year. Of the important developmental tasks, there are serious problems with the tasks of:

- a) the second generation digital transmission system;
- b) a new generation of local communications cables, including connectors (continuing difficulties with securing the production of Zetabon foil and the developed varieties of these cables is so far incomplete). There has been progress in the FMEP department positively negotiating the possibility of the delivery of self-shrinking connectors by importation from socialist countries from 1986 on;
- c) the medium and large capacity automatic telephone centrals JSPST [as published; probably Unified System of Telecommunications];
- d) the development of customer facsimile equipment within the ZAVT [as published] has not taken place;
- e) despite all efforts, including discussions at the highest level, we have not succeeded in getting the development of radio relay transmission vehicles and the 2 MF 960/TV radio relay equipment included in the Seventh and Eighth 5-Year Plans.

--Measures to reduce the development timeframe for tasks performed by the communications organizations were approved already at the level of the development plans. The resolution period for the tasks included in the plans after 1983 is not to exceed 3 years. The important tasks of these plans have been and are designated as mandatory for the material incentives of the URS and TUS directors. In comparison with the planned resolution time limits up to 1983, when the average planned period for resolution was 4 years at the Prague TUS and 5 years at the Bratislava TUS, after 1983 the average planned period for resolution had reached 2.8 years at the Prague TUS and 3.2 years at the Bratislava TUS.

--To ensure a timely connection between development and applications of the results of research for tasks supporting communications, there was a bilateral agreement made between the VUS and the Prague and Bratislava URS's. The method of negotiating and tracking developmental tasks has proven itself and it has contributed to the mutual exchange of information and improved cooperation, as well as spanning the stages of research and development of new equipment. As examples, one can take the development of electronically controlled marking equipment for postal money orders, the resolution of the equipment for reading luminescent codes, the coding workstation for mail, and the SLEAP and SOPUS equipment.

Fulfillment of the Measures is closely connected with the tasks assigned by the minister of communications on the development and greater utilization of the developmental production base for communications of January 1983. This concerns, in particular:

--Operations of the Prague TUS as the highest level supplier of technology in the field of postal mechanization, especially for the Prague-Malesice PPB, are running smoothly and the organizational changes carried out in 1983 have proven themselves. The negotiated capacity from enterprises of the Vc KNV [probably East Bohemia Kraj National Committee] is being utilized and represents delivery of products worth Kcs 61.2 million (1981-1984) and planned deliveries valued at Kcs 19.8 million (1985).

--At the Prague RVS [as published], there has been established stricter control over demands for work by plant 05 for 1985 and especially for 1986 so that a higher share of production will be achieved for the communications department. The production volume delivered outside the communications department amounts to 69 percent (1985) of the total volume and is thus still disproportionately high.

--The specified growth in employees (production workers) in 1984 was not met by either TUS.

In the period just completed, there continued to be a number of problems and deficiencies showing up in the work of both TUS's. In particular, these were:

--Delays in putting the developed equipment into production. This showed up mainly with the MAK equipment (TUS-B), the equipment for switching telephone calls to booths, and the EMIK equipment (TUS-P).

--The low quality of products, especially the public pay telephones from the testing series (TUS-P).

--Insufficient volume of production performed by our own offices, especially with postal mechanization products in the Prague TUS, which is mainly getting production from the Vc KNV enterprises and does not have enough of its own production. This situation is connected with the shortage in production workers and cannot be further tolerated.

Accelerated Application of R&D Results to Communications Operations

All tasks of the state and departmental plans for the Seventh 5-Year Plan had executive agencies designated, who were for the most part those levying the task and to a lesser degree communications organizations. For the years of the Eighth 5-Year Plan, the coordination plans made much greater and more thorough use of implementation directly at the communications organizations which are the first to utilize the results of the tasks performed.

In levying tasks and negotiating the plan between the FMS and the VUS, possibilities for reducing the timeframe for task resolution and accelerating the introduction of results into practice have been and still are being checked out.

But there are deficiencies in the quantification of the effectiveness of applying the results of R&D tasks in the phases of task initiation and completion in regard to methodological problems in evaluating their effects on conditions in the communications networks (many times the effects show up at places other than where the action was taken).

In preparing the plan (at this time particularly the Eighth 5-Year Plan and 1986), care is taken to have application of the outputs of the state technical development tasks affect other parts of the plan; for example, in working up the agreement between the FMS and the FMEP, the completed developmental projects are taken into consideration in the delivery portion of this agreement with the planned deliveries and the appropriate resources are provided for in the investment portion of the plan. The executive agencies should proceed similarly for other tasks as well in accordance with the methodology.

At the present time, there are serious deficiencies in organizational, personnel, and sometimes even financial support for checking out new equipment for proper operation.

In the proposal for the Eighth 5-Year Plan plan, the role of the communications organizations as the executive agencies of all the planned material applications of outputs was emphasized. It will be necessary to further reinforce direct management and to apply personal responsibility thoroughly for the implementation of the results of completed R&D tasks.

In the design of communications construction projects and the rebuilding and modernization of technological equipment, new results of technical development were applied and electronics and computer equipment were utilized.

Examples are:

--the design solution connected with automation of control of the technological processes of the telemechanized radio communications system of western and central Slovakia (by SR [Radio Communications Administration] Bratislava and Spojprojekt [Communications Design] Bratislava);

--working out the programs for automation of design which improve the technical economic construction project parameters and are oriented toward savings in labor;

--in working out the preliminary design for PPB Malesice, there were, among other things, a savings of 5.7 percent achieved in investment expenses and a 44 percent reduction in the demand for electrical energy;

--the productivity of labor was increased by 30 percent in designing the ATU [automatic telephone exchange].

The newly checked out modern equipment was introduced on a priority basis for modernization and development of the communications networks in Prague and Bratislava. As examples one can give the delivery of the E10 system and the public pay telephones from Poland for Prague and Bratislava and the equipment for low- and medium-level mechanization for the post office (postage, stamping, and weighing machines, currency counters, etc.). In Prague, the first optical line, the PCM transmission system, was installed and they checked out the new telephone instruments, equipment for switching calls to the booths, means of pressure protection for cables, the EP 128 and 512 branch exchanges, the UE 200, and others. However, the communications organizations often did not show enough initiative in their approaches to ensuring testing operations and cooperation during testing operations, including the procedure used in introducing new equipment into continuous operation. There are administrative difficulties and the conditions for tests are not always set up on a timely basis.

More significant results were achieved also in the R&D tasks carried out by the communications organizations. For example, at the Prague Communications Assembly Enterprise after the production technology had been worked out, production was started on compression connectors based on a Czechoslovak invention for 0.6 to 0.9 mm cable strands and connecting pliers comparable with the world-class quality. In connection with these jobs and within the framework of the tasks of the state target program A 08 for the Eighth 5-Year Plan, this office is making preparations for a task of expanding the inventory of types of compression connectors for cable strands from 0.4 to 1.3 mm and the development and production of auxiliary equipment, instruments and aids for cable work.

In the introduction of new equipment into production, shortcomings showed up in delays in the negotiation and approval of the technical conditions for production and transferral (TP) between the VUS and manufacturers.

Testing, Technical Standardization, and Measuring

Uniformity and accuracy of measurements and testing of operational equipment has been and is provided by departmental measuring which is made up of the Central Measuring Center (CMS) in the VUS and the measuring centers (MS) at the communications organizations.

The CMS has regularly checked on the enterprise reference equipment of the organizations and taken care of checking on and adjusting other specialized measuring instruments. In the past 2 years, it has calibrated 96 (1983) and 120 (1984) enterprise reference equipments and has checked on and adjusted an additional 278 measuring instruments.

The CMS is gradually carrying out its inspection of communications organizations with a goal of increasing the level of communications measuring services as a whole. In 1984, the CMS carried out inspections at the Bratislava SR, the Bratislava SDK, and the ZsRS, SsRS, and VsRS [probably West, North, and East Slovakia Communications Directorates]. In these audits, excellent operations were found at the MS at the ZsRS in Piestany, which could be considered a model operation, and at the Bratislava SDK. In light of the inadequate equipping discovered at the MS offices at the Bratislava SR and the VsRS, these organizations have taken actions which will correct the situation. The fact that when these services were started they discovered, for example, that up to 50 percent of the general purpose measuring instruments were outside tolerances testifies to the need for and effectiveness of the measuring service's efforts. The departmental calibration office annually inspects 10,000 measuring devices and repairs about 1,000 of them. At the same time, the period for repairs has been reduced to several months as a rule and the level of costs is about 10 to 30 percent as compared to the repairs performed by organizations outside the department.

The main problem in making measurements is the obsolescence of equipment and shortages in measuring equipment manufactured in Czechoslovakia and the socialist countries. For a number of instruments, communications is dependent on imports from the nonsocialist countries. One of the reasons is the fact that the FMEP enterprises in a number of cases refuse to develop and produce small numbers of measuring instruments and testing equipment (for example, jitter measuring instruments and multifrequency signaling equipment in telephone centrals) and they have not applied the principle that newly introduced equipment must be provided with measuring equipment as well.

The departmental testing and acceptance agencies have further increased the pressure for improving the quality of the equipment delivered from Czechoslovak manufacturers.

In the testing facilities of the VUS in the years 1983 to 1985, most of the working capacity was committed to checking out equipment and technology already in operation. This can be seen from the following examples:

--The properties of the spare parts for the NEC automatic letter sorting machine were checked out and appropriate actions proposed. Extensive changes

were proposed for the IPF 80/D semiautomatic letter machine to increase its operational reliability. The result is higher quality production, improved maintenance, and substantially greater operational reliability. The properties were checked and proposals made for improving such postal mechanization resources as the Grafos imprinting machine, artificial leads, transport carts and the MV 3 weighing machine (from the USSR) which were modified for the material capabilities of the CSSR and put into operation in that variation.

--In telecommunications installations, their own equipment was used to study and evaluate the effect of dusty conditions and the influence of atmospheric pollution on the functioning of centrals. Thus it was possible to make decisions with a greater degree of certainty on leaving out of construction projects any large-scale air conditioning of local and switching point telephone central exchanges of Czechoslovak manufacture and thus to achieve significant energy savings (there remains only a rough regulation of temperature to stay within a limited range and the regulation of humidity in the winter months and air filtration has been abandoned).

--There was long-term checking of the most troublesome relay of the Czechoslovak telephone centrals. Proposals for improvements and extending the life of the relay were approved by the manufacturer and will be directly applied to operations by means of melinex foil inserts.

Research and Development Information (VTEI)

In order to improve the quality of and make more effective the VTEI system, a number of actions were taken at the level of the FMS, the Branch Communications Information Center (ODIS) in the VUS, and that of the basic information centers (ZIS) in the organizations.

Since 1 July 1985, the departmental system has been supplemented by specialized centers for the fields of design at Spojprojekt Prague, construction and assembly of telecommunications equipment and networks at the Prague City Postal Administration (MPS), and the development and production of communications equipment and material technical support at the Prague TUS.

The level of the ZIS's at the communications organizations varies widely. While at some of them the exchange of information with the ODIS has increased and their equipment and utilization has improved (especially at Spojprojekt, MPS, TUS, SDK Prague, JmRS [South Moravia Communications Directorate], MTU [probably Interurban Telephone and Teletype Central] Prague, and SsRS [North Slovakia Communications Directorate]), others are not developing in a comparable manner or have not even been created. Their operations are inadequately supported at the JcRS [South Bohemia Communications Directorate], StcRS [Central Bohemia Communications Directorate], RT [possibly Technical or Telecommunications Directorate], and RP [Postal Directorate] Bratislava. The ODIS service is utilized by the communications organizations to a low degree overall. This is shown by the fact, for example, that during 1984 there were no requests (according to VUS data) for any research papers, translations arranged by the ODIS, or copies of articles from foreign periodicals by the Prague and Bratislava SRs, StcRS, ZsRS [West Slovakia Communications Directorate], RT

Prague, MTTU, Spojprojekt Bratislava, PNS-UED [as published] Prague and Bratislava, or RP [Postal Directorate] Bratislava. There are also great unused possibilities in the organization for disseminating information and knowledge among the employees because the supervisors are keeping informational materials to themselves and not passing them on to their ZIS or to other employees and the information is not fulfilling the purpose for which it was published. This is also true of the departmental professional periodicals bought by the organizations.

The Development of Creative and Rationalization Activities

Of the extensive collection of tasks approved, I will cover only the invention and improvement movement (VZH).

The development of the VZH and the fulfillment of the programs for the creation and implementation of inventions and improvement suggestions can be seen from the data contained in the table.

	1983		1984	
	<u>program</u>	<u>actual</u>	<u>program</u>	<u>actual</u>
Number of submissions:				
inventions	24	35	25	33
improvement suggestions	2,241	2,867	2,539	2,838
Number of theme tasks				
promulgated	125	149	132	178
Special contribution				
achieved from utilization of inventions and improvement suggestions				
(in thousands of Kcs)	39,261	49,149	41,149	87,675

Special attention was paid at each level to rapid decisions on submissions received for improvement suggestions and maintaining the Law No 84/182 of the Sbirka. The average time for making decisions on improvement suggestions in 1984 was 2.1 months and there were no violations of the law.

Implementation of important improvement suggestions with application to the whole department was ensured in the technical development plans of both URS's [Central Communications Directorate], where they especially implemented:

- automatic statistical testing equipment (already being produced in TUS Prague),
- a tracer for active operations of subscriber stations (development is being completed in TUS Prague),
- small voltage testers (production in TUS Bratislava), and
- power sources for connectors (production in TUS Bratislava).

Implementation of other improvement suggestions is taken care of in the applications workshops of the communications organizations. Successful examples are the production of the wideband distributor which replaces equipment imported from the nonsocialist countries (a joint application of both SR's) and a measuring instrument for storage batteries (SR Prague).

A Program of Development for the Creation and Application of Inventions and Improvement Suggestions was worked up to direct the invention and improvement movement in the Eighth 5-Year Plan. It assumes a growth in solutions at the invention level of 2 percent and 3 percent for improvement suggestions annually.

Microelectronics, especially microprocessors, are used in much of the equipment development and in improvement suggestions implemented. Effective utilization of microprocessors can be introduced into the development of equipment for monitoring the status of VTA [as published, probably deals with R&D], control of the radio communications system, equipment for the processing and printing of bundles, for control of semiautomatic package sorters, for long-range monitoring of the status of the telecommunications network (SDK), etc.

To improve the quality of management, especially of improvement suggestions concerning the unified telecommunications and postal network, whose implementation is dependent on agreement by the FMS, the appropriate portion of the FMS Directive for Management and Organization in Matters of Discoveries, Inventions, Improvement Suggestions, and Industrial Models in the Communications Department, which contributes to more rapid decision making and to reducing the administrative activities for improvement suggestions.

Despite the successes achieved in the field of inventions and improvements, the following shortcomings are showing up:

- a low proportion of positive decisions on the improvement suggestions submitted;
- in some cases, a long period for a decision to be made on the improvement suggestion application;
- insufficient capacity of the applications workshops at the communications organizations and problems in securing materials for implementing the improvement suggestions;
- inadequate support for the application of thematic tasks carried out, at all levels of management.

A competition for the best improvement suggestion has been organized in the communications department. In these contests, there is an annual evaluation of the three best suggestions of innovators up to 35 years of age and older. The results of the competitions are published in Vestnik FMS [FMS Herald] and in the communications press. The Vestnik FMS also lists employees with approved and disseminated improvement suggestions and with declared and resolved thematic tasks.

From information on the directly managed communications organization, reports from the FMS units, the results of audit activities, and other information, the conclusion can be reached that many of the tasks have been completed and that the Measures are acting positively on accelerating the application of technical development and on activating creative work in the communications department. Despite this, however, there are still a number of deficiencies and unresolved problems of both a subjective and an objective nature which negatively influence technical development in communications and its accelerated application. It must be stated that actions have already been taken by the FMS and the communications organizations on a number of the deficiencies discovered. It is a matter particularly of the following problems and deficiencies:

a) in processing and utilizing forecasts, concepts, outlooks, and developmental materials

--to discuss thoroughly and to make specific these materials with the units and communications organizations involved in the interest of improving their quality and practical utilization for the agencies of territorial and regional planning and for the preparation of design documentation, and

--to expand cooperation with the CSAV [Czechoslovak Academy of Sciences] and other agencies in the preparation of forecasting data for communications for predictions worked up to the year 2010 horizon with a goal of demonstrating the need for more intensive development of communications and the social effectiveness of such development;

b) in R&D planning and management

--to complete updating the published FMS standardization documents on creating the prerequisites for improving the quality of R&D management in the period of the Eighth 5-Year Plan and in connection with the measures which will be issued by SKVTRI (this is a matter in particular of the Directive for Activities of the Operational Laboratories; the Directive for Planning, Executing, and Utilizing the Results of R&D Tasks in the Communications Department; delimiting the areas of activity of the technical development elements in RS-type organizations; the principles for material and moral encouragement of employees in the research, development, and preproduction stages, etc.);

--within the framework of the "Main Directions for Economic and Social Development in the CSSR," or their modifications, to consider adjustments in the economic tools with a goal of accelerating the technical development and the rationalization work of the VAKUSes [Communications Computer and Control Centers];

--to ensure higher motivation and creative activity by communications workers in technical development and accelerated application of their results to practice;

c) in research

- to increase the activity of communications organizations in assigning research and development tasks in relation to the actual operational needs;
- to increase the activity of the VUSes in relation to the tasks of R&D support (tasks requested by communications organizations) and the institute tasks;
- to intensify and improve the quality of cooperation with the CSAV and with the VS [probably Higher Schools], including the problem-solving and other capabilities of computer technology;

d) in the development and production of communications equipment

- to resolve the problems of support of research and development work on the transfer or accelerated development of equipment included in Appendix 1a of the agreement signed by the FMS and FMEP, especially transfer of the development of the terminals for Teletex and Telefax; the development and production of local communications cables with multilayered sheathing (Zetabon), including the connectors; the development of modems for data transmission; the development of electronic communications systems (JSPST-N and JSPST); digital transmission systems (JSCPI); optical transmission systems developed under A08 119 116; and equipment for direct transmission of television and radio programs from satellites;
 - to derive conclusions and measures required from the inadequate fulfillment of tasks in the development of the production base, especially at the TUS Prague, and to improve the quality of operations in providing more deliveries of equipment for the mechanization of the post office and PNS;
 - to increase the cooperation between the VUSes, TUS Prague, TUS Bratislava, and the RVSeS, including checking out the equipment developed, negotiating technical conditions, and working up data for design projects;
 - to increase the share of development and production of the RVS 05 plant for communications needs;
 - in a number of cases, the FMEP department does not ensure timely development and delivery of measuring equipment and testing instruments necessary for the construction and operation of telecommunications and radar equipment;
 - the FMEP and FMVS [Federal Ministry of General Engineering] refuse to provide for the development of equipment for mechanization of the post office and PNS ("small" mechanization, such as duplex adding machines, counter terminals, etc., as well as equipment for dispatching and redispaching print and others);
 - some equipment is developed behind schedule at the TUS Prague and the TUS Bratislava and does not meet the desired parameters;
- e) in accelerated application of the results of technical development in operations

--to ensure keeping to the path of the implementation plan for test and certification operations at the appropriate communications organizations and to have the VUS provide the necessary data on a timely basis;

--to carry out the evaluation of test and certification operations of selected important equipment on a commission basis with the participation of FMS management;

--to ensure that the communications organizations keep to the path of the plan for selection of equipment developed immediately after its certification;

--it is necessary for the VUS to fulfill more thoroughly the task of checking the parameters of selected important equipment in operation;

--it is necessary to intensify the evaluation of the effectiveness of the R&D tasks carried out and the benefits achieved;

f) in the utilization and development of the departmental VTEI system

--there are shortcomings in the operations of several basic VTEI centers;

--information and professional literature are not adequately reaching down to the individual operations;

--there is a low level of utilization of the VTEI services at the VUS (ODIS) on the part of several communications organizations;

--it is necessary to improve the level of information of the communications organizations on the results of the tasks carried out by the VUS Prague and the URCS Bratislava and on knowledge gained from official foreign sources;

g) in the development of creative and rationalization activities

--in some cases, there is still a persistently long period for decision making on improvement suggestion applications and deficiencies in distributing improvement suggestions to other organizations;

--this is insufficient capacity in the applications workshops of the communications organizations and problems with securing materials for carrying out the improvement suggestions;

--there is insufficient support for application of thematic tasks carried out and a low proportion of thematic tasks carried out;

--it is necessary to act in a purposeful manner to increase the number of improvement suggestions and the proportion of them implemented;

h) in training personnel with regard to the introduction of microelectronics into communications equipment and networks, we must intensify the instruction of professional and other employees, especially in the applications of microprocessors and knowledge of software. The method of training operations workers

in new equipment or technological procedures must be improved. We must influence the course of instruction in higher schools of an electrical engineering orientation.

In order to overcome all of the above deficiencies and resolve the problems, it is necessary that special attention be paid to them at all levels of management in the light of the conclusions of the 15th Plenum of the CPCZ Central Committee and the conclusions and new approaches rising from discussions of the CPSU Central Committee.

In accordance with the tasks accepted by the minister of communications on the basis of discussions of the collegium, it will be necessary to carry out by the end of 1985 a thorough evaluation, clarification, and augmentation of the Measures for Accelerated Application of R&D in Communications by the individual communications organizations and in particular to create an atmosphere of creative activity for the utilization of knowledge and the results of technical development in the specific conditions of the organizations, plants, and offices. An important task is also preparation of the R&D plan for the period of the Eighth 5-Year Plan; readers of PTT REVUE will be kept informed of developments in this area.

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EAST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

POLISH S&T POLICY, PRIORITIES OUTLINED

Warsaw PRZEGLAD TECHNICZNY in Polish No 10, 6 Mar 86 pp 15-18

[Interview with Vice Premier Zbigniew Szalajda, chairman of the Committee for matters of Science and Technical Progress by Bronislaw Hynowski; date and place not specified]

[Text] [Question] Mr. Premier, there has been a lot of talk about the science and technology policy of the state, and lately there has been even more. What should that policy be so that the intellectual potential of our leading scholars and our rank and file scientists can begin to pay off both in pure science itself and in applied science?

[Question] Through the last two 5-year plans, 1976-1985, the guiding system for progress in science and technology which operated in Poland was based on eight research and development programs and a few dozen key problems, which were supplemented by several hundred departmental problems. In this system, through the concentration of material and financial means and the integration of scientific-research groups, conditions were to arise for accelerating applications of the results of research and development work in economic practices.

However, as was especially evident in the second 5-year period, it turned out that despite many indisputable positive results the total profit to the national economy from progress in science and technology was small both in comparison to the means used and to expectations.

Analyzing such shortcomings as: not keeping pace with the time-limits for accomplishing projects, insufficient financial discipline, ungrounded broadening of subject areas, identifying crucial difficulties only after many years of continuous work and low efficiency in applications--has allowed us to distinguish certain shortcomings in planning, coordination and other organizational areas.

A confrontation between the results obtained and disturbing indicators in the national economy, such as: labor productivity, energy consumption of production, prices obtained in export and import of goods--further sharpens our criticism of the system we have used up to this time for guiding progress in science and technology. As a result of a basic analysis of the existing

system, the party and state leadership has have decided to introduce a new system for guiding progress in science and technology in the national economy at the beginning of the 1986-1990 plan. That is why the Sejm, through the Council of Ministers of the PRL, has earlier, in December 1984, called into being the Committee for matters of Science and Technical Progress and an executive organ of this committee: the Administration for Scientific and Technical Progress and Applications. A cohesive policy, strategy and guiding organization is considered to be an absolute necessity for progress in science and technology in the state as a basis for new solutions--this is probably the most concise answer to the question posed. An unusually important factor is the principle of continuing work on research and applications, which should ensure the efficiency of realizing solutions to problems and in subject areas.

[Question] What is the committee, which you chair as vice president of the Council of Ministers, doing to establish actual policy for science and technology, and what is the role in this of the social organizations, especially NOT? What I am trying to get at is that more and more new changes cannot appear without a need for perspective parameters of an ambitious program, with which Polish science should provide us.

[Answer] The committee is a new and very original solution. Its character is representative because representatives from the principal fields involved in the creation of progress in science and technology in the country participate in it along with representatives of economic, social and political organs. At the same time, the principle of its great decision making and executive authority has been guaranteed. The committee presently consists of 60 persons, among whom are renowned representatives of science and technology, directors of manufacturing institutes, representatives of party organs and the ministers of the most important economic departments.

Problem groups and commissions have been formed within the framework of the committee, whose purpose is to offer opinions and counsel. Some of their main tasks are: analyzing the state of development of science and technology in the country and in the world, working out a prognosis and an evaluation of how programs under examination conform with the socio-economic plans for the development of the country, initiating scientific and technological works on the basis of evaluations and analyses of the achievements of science and technology, and disseminating them in the national economy.

The decision-making organ of the committee is the presidium, composed, in addition to the chairman, of four deputies supervising all fields of creativity in the progress of science and technology in the country: the minister-director of the Administration for Scientific and Technical Progress and Applications, the deputy chairman of the Planning Commission of the Council of Ministers, the minister of Sciences and Higher Education and the secretary of science of PAN.

We treat NOT as one of our main partners in the realization of our aspirations. Representatives of NOT are members of the committee, and we have taken up some matters at the suggestion of that institution. As an example I could mention scholarships in the name of the President of the Council of Ministers in the field of scientific and technological development.

Returning to the more fundamental portion of your question, we must now plan for two periods in our science and technology policy. In the first, which should not last more than one 5-year period, we must take advantage of all positive results of the system of governing and key problems used until now and liquidate its faults, lest they enter into the new system. Meanwhile, in this period, we should assist in conquering financial and payment barriers, so that our economy will again take on clear traits of development. In this first period we will therefore prefer research and development tasks which can be quickly applied and which have a high earning capacity. The point is to create conditions for modernizing the Polish economy in the 1991-2000 decade. In this same period science and technology policy should become an effective component of the policy of socio-economic development of the country, realized strictly within a program based on the new structural changes. Here I would like to point out that although less than 1.4 percent of the national income was allocated to the development of science and technology in 1984, and less than 1.7 percent in 1985, in the present year 2.2 percent will be allocated to it, to which we must also add the quota for the Technical-Economic Fund of enterprises to correct this indicator.

To assess the influence of the 1986-1990 5-year period we will study the proportion of funds allocated for individual types of programs to search for a distribution which will provide the best economic effects. The interdependency of these programs demands a systematic investigation not only of the planning stages but also of implementation. Some of these implementations, especially those which are unmethodical, are very difficult to uncover, and other, profitable ones will have to be specifically created. For example, groundless duplication of work should be immediately liquidated, however, related activities which might lead to accelerating the implementation of a program (cooperation) or raising the quality of products (competition) should be introduced or sustained.

[Question] What is the division of authority among the Committee for matters of Science and Technical Progress, the Ministry of Science and Higher Education, The Polish Academy of Sciences and the Administration for Scientific and Technical Progress and Applications? Each has its committees, programs, studies and experiments, but a clear objective is not apparent?

[Answer] I cannot agree with that statement of the matter, for the objective is very precisely defined in the directions of strategy and priorities for scientific and technical development, in the form of central programs of basic research, central programs for research and development and about 300 government contracts. These latter are composed of projects which are very likely to result in application because of the guarantee of an increase in funds from year to year for this objective, and the time it takes to realize these projects will not exceed the 5-year period.

The Polish system for guiding progress in science and technology has a 3-tiered structure. Operating on the first is the Committee for matters of Science and Technical Progress with the Council of Ministers as well as its decision-making organ--the presidium of the committee and the executive organ--the Administration for Scientific and Technical Progress and Applications. The most important decisions are worked out on this level and the general

planning and coordinating functions of scientific and technical development are safeguarded. This is where the basic directions, programs, etc. are created. The plan for for scientific and technical development is also introduced to the NPSG on this level.

On the second level--that of the ministers--scientific and technical development is created in the individual branches not embraced by central planning. Central programs and government contracts charged under the supervision of the ministers is also coordinated here. A distinctive role falls to the Polish Academy of Sciences and the Ministry of Science and Higher Education on this level. These institutions not only supervise the implementation of their research programs but are also responsible for creating and implementing the central program of basic research.

On the third level--of realization--scientific and research and and development branch units operate as well as subsidiaries of industrial institutions, which carry out projects assigned to from the central, departmental and their own development programs. Also here are the appointed entities which coordinate the realization of central research and development programs instituted and the entities performing coordinating functions based on the general agreements transacted by the Administration for Scientific and Technical Progress and Applications and by the ministries.

--to a significant extent the key role of the committee and its presidium will be to decide which activities are effective in the established economic situation and which keep pace with the demands of the moment...

--We are convinced that the organizational concept we have adopted for creating scientific and technical progress, which marks the committee as the entity to work out the main decisions of the science and technology policy of the state, its presidium as the decision-making organ and the Administration for Scientific and Technical Progress and Applications as the executive organ, will be effective in practice. It should provide for the full realization of the principle mentioned previously--a cohesive science and technology policy for the state.

[Question] Mr. Premier. Scientific and technical progress never leaves the columns of the press nor the mouths of many Poles. However, except for the words themselves we never see the mechanisms that are preferred. Neither society as a whole nor the circle of technological intellectuals can state unequivocally what the technology policy of the state is? Are we doing everything by bits and pieces, or have we decided, despite the "sweat and tears" of various groups, on three or four directions in which to concentrate our efforts and funds?

[Answer] We do not intend to do everything. We will participate primarily in five high priority directions of scientific and technical progress, contained in the Complex Program for Scientific and Technical Progress of the Countries of the RWPG to the year 2000 signed in December of last year. In creating the NPSG for the 1986-1990 5-year plan we have adopted 15 directions in the area of scientific and technical progress, in which our research and development problems should be concentrated:

- new technologies for obtaining energy and industrial raw materials,
- new metallurgic, construction and chemical materials of unique, useful characteristics,
- the development of energy management and nuclear technology in industry, agriculture and medicine,
- the development of electronics, telecommunications and information media to establish a basis for fundamental changes in the quality of life, working conditions and social culture,
- selected chemical products, and especially low-tonnage chemistry and pharmaceutical products,
- improvement and development of systems of road, rail and air transportation.
- the automation and robotization of the economy,
- energy and material-saving technologies and construction methods, including recycling and utilizing secondary raw materials and wastes,
- improvement of the exploitation of national resources,
- improvement of the utilization of energy and fuels through improving the efficiency of recipients and the general electronization of systems and mechanisms,
- high efficiency technologies, including biotechnology,
- research and measuring equipment for the needs of science and medicine,
- protecting health, work and the natural environment,
- new materials and technologies for housing construction,
- development of systems for the efficient functioning of society and the economy. I would like to point out that independent of the pace of realization of the various tasks, we are constantly working on further concentration of subject areas and their application to comply with the instituted changes in the structure of the national economy.

In its session in November of last year the committee assessed the NPSG plan in the field of science and technical development. Although work is still being done to perfect this assessment, the presidium has made a preliminary decision to finance those tasks that were begun this year lest their realization be delayed.

[Question] How are we to understand the concept of "running science and technology?" We know from experience that these are not fields of human activity and intellectual creation which can be skillfully guided.

[Answer] It was you who used the formulation "running." It is not the most fortunate. I prefer "organization by the state," for that is what all of the countries in the world now do.

In Poland, like the majority of the countries of the socialist commonwealth, there are four regions where scientific and technical progress is created and realized. They are: the outposts of PAN, the institutes of higher education, the research and development subsidiaries and the industrial enterprises. We will perfect principles and forms of cooperation in these regions. This is also where the problems of scientific and technical progress will be solved in the years 1986-1990. Here we differentiate six categories of programs:

--the central program of basic research created and implemented primarily within PAN and the higher schools, engaging about 10 percent of the potential creators of science and technology. Between 10 and 20 percent of the total costs planned for scientific and technological progress in the national economy has been allocated for this program.

--the central research and development programs created and implemented primarily in the research and development subsidiaries of industry, engaging about 23 percent of the personnel and about the same percentage of the funds allocated in the country for research and development. This is a collection of about 100 complementary projects (subject areas) concretely connected to the socio-economic goals, their end results must have an objective character, permitting an unequivocal physical and economical evaluation. We take it for granted that these programs should be the main generators of government contracts,

--government contracts, realized primarily in industry with significant participation from its research and development subsidiaries. They engage 20 percent of the work capacity and funds centrally allocated for research and development. For this 5-year period there are more than 200 subject areas proposed, which were chosen from 1800 applications,

--departmental research programs, created on the ministerial level and realized primarily in industry and its subsidiaries. They are of a supplementary character and about 10 percent of the central planning funds for research and development have been allocated for them,

--institutional research and development programs, arising directly in the industrial enterprises and absorbing about 30 percent of the funds proportioned in the national economy for scientific and technical progress,

--a program of general technological activity, such as: scientific, technical and economic information, standardizing, patenting, metrological etc. undertakings.

Perhaps this seems too complicated, but please note that on one hand it safeguards the strategic interests of the state, and on the other it provides enormous possibilities for independent activities.

[Question] Mr. Premier, there is a great deal of talk about the fact that we must primarily develop applied science, to provide research that is the most useful for the economy. Certainly this statement is accurate and it is what others are doing, but it is not possible without a corresponding intellectual level, a level of knowledge and basic research and a desire for discoveries that are not always practical. Only on the basis of a great creative awakening can discoveries and inventions arise which are sensational and revolutionary.

[Answer] We know what the real role of science, research and development subsidiaries and industry should be in creating and applying scientific and technical progress in the national economy, but we have also noticed that the viewpoints of the people of science and industry are not always sufficiently convergent. That is why we will try to introduce a common ground, which is indispensable for realizing the central financial programs, especially when coordination will be charged to units of the research and development subsidiaries.

Whether we can guarantee a sufficiently rapid rate of application of technical progress in the economy will depend on the cooperation and the mutual integration of scientists, branch research and development subsidiary employees, and the engineers and technicians of industry. For this can be reached only through the common solving of difficult and complex tasks and in a climate of partnership.

[Question] What activities are foreseen to integrate the scientific and technical environment amidst the main objectives of the development of civilization in Poland?

[Answer] In addition to changes in the organizational and economic spheres we feel that much work remains to be done by the direct influence of people who have a decisive say in the creation and application of scientific and technical development in the economy. We intend to establish new human sources of technical and technological works, we will raise the rank and position of technical research employees. Whenever there are significant achievements we will effectively use the propaganda of the media, we will bestow a high rank on the prizes of the Committee for matters concerning Science and Technical Progress for achievements providing significant economic effects. We will also help in the building of good workshops of inventors, among other things with the stipends of the president of the Council of Ministers for scientific and technical progress.

[Question] Mr. Premier, in the world at large science and technology mean the advance of civilization, but our awareness of the role of technology in the state and society is very weak. But the policy of promulgating, popularizing and exalting technical culture is far from perfect, in fact it hardly exists at all. The technical press is a pariah in the Polish press (large restrictions in paper, a lack of scientific journalists), the situation with technical books is probably similar, especially popular ones. In its assumptions does the committee take it into consideration that without social awareness of the meaning of technology there will be opponents to achievements

of a high standard in scientific and technical progress who will try to stop them? What sort of activity is foreseen to avoid such a situation?

[Answer] In our strategy for scientific and technical progress, our leading principle is to remove the obstacles to applying the realized projects which occur in industry. Our most important systematic solutions tend in that direction, both economically and organizationally. Advanced work has already been done on perfecting the credit and tax mechanisms, which should encourage industry to undertake the tasks of application, while considering the decisive factor of sensibly weighing the risks and end results.

The second important element of this strategy is introducing effective disciplinary solutions into research and development subsidiaries, and thus into research and development centers and central laboratories. At the same time we intend to undertake activity to strengthen these subsidiaries, and help them, among other things, to establish stable, legitimate mechanisms, applications which would be pro-effective to the economic and financial system, to provide for their most important equipment needs, to safeguard conditions for continuing to keep workshops of inventors and finally--to form a pro-innovative attitude.

A very important component of our new strategy is the effort to safeguard the real role of the mechanisms of central financing for scientific and technical progress. In this 5-year period we will dispense three kinds of financial means: the central fund for research and development work, the central fund for assisting application and the central foreign currency reserve.

The central fund for research and development work will be created in the enterprises on the basis of allowances for the value of production, whose coefficients will be established for the 5-year period in proportion to the science consumption of the branch. Half of this fund will remain in the enterprise for financing plant plans for technical and organizational development. The other half will be delivered under obligation to the central fund for additional supply of subsidies.

The central fund for assisting application, which is of an investment character, will be created and used above all as low-interest credit, which together with leading tax incentives will be a factor in imparting dynamism to applications. Complementing these two funds will be the means from the foreign currency fund, allocated primarily for assisting applications. This fund will be established every year as a specified allowance for the value of planned total imports in the national economy.

Personally, however, I do not agree with the statement that the technical press is a pariah in the Polish press, after all this press publishes dozens of titles. The fact is that printing difficulties affect it severely, as they do popular technical books. The committee is aware of this problem and we also intend to tackle it.

I would like to stress here that the role of this press, in particular that of the oldest journal for engineers and technicians, PRZEGLAD TECHNICZNY, is very large. Bearing witness to this, e.g. is that it encounters broad interest in

many circles. Since we are aware of this, we will propagate the significance of S and T progress in contemporary society and the state precisely in the columns of PT. We want information about the work of the committee and the presidium, about all initiatives, undertakings and objectives, to find a permanent favorable place in the form of a cycle of articles in PRZEGLAD TECHNICZNY.

We think that this weekly is and will continue to be not only an information forum and a platform for the exchange of information, but at the same time a good place for an even more frequent expression of recognition for the creators of science and technology.

--An essential component of science and technology policy, without regard to the stage of its formation, will be the cooperation with the community of socialist countries, especially with the Soviet Union, in scientific and technical progress...

--In establishing the patency of our common ideological objectives, we must stress the economic aspect of this cooperation, most evident in recent years in the Western policy of economic sanctions.

Poland has actively participated in the crucial preparation and the definition of conditions for realizing the Complex Program for Scientific and Technical Progress in the countries in the RWPG to the year 2000. We will participate in all five of the priority directions contained in this program, i.e. in the electronization of the national economy, complex automation, the acceleration of the development of nuclear energy, working out and supervising the production of new materials and the acceleration of biotechnological development. Polish scientific and research and development organizations are taking part in the realization of more than 90 percent of the problems foreseen in this program.

We consider the Complex Program to be an undertaking which is innovative and concrete in relation to the common activities undertaken earlier of our states in the area of science and technology. It meets our needs and aspirations entirely. However, the Long-Range Polish-Soviet Program for Scientific and Technical Progress, which was signed in September 1985, initiates development in seven main directions, the first five of which coincide with the directions recognized as priorities within the framework of the program of the RWPG. Added to them are development of the machine industry and modern market goods.

In the realization of this program we foresee the creation of cooperative research groups, planning offices and institutes, and exchanges of scientific and technical documentation, licenses and "know-how" on a market basis or without remuneration. Additionally, we are planning for the possibility of a rapid turnover of sub-assemblies, assemblies, materials and technological inventions. Also initiated is an exchange of specialists and mutual employment of responsible specialists and experts without the exchange of foreign currency.

The achievement of significant technical and economic effects are initiated as a result of applications to production of the fundamental solutions contained

in the long-term program. This will primarily mean increasing labor productivity, decreasing the use of materials and energy, increasing the level of technical goods and significantly accelerating other coefficients of scientific and technical progress. We will depend primarily on engineers and technicians to fulfill the provisions of this ambitious program, on whose talent, knowledge, work and commitment the country as a whole has always depended.

--Success in realizing the Complex Program of the RWPG and the Long-Term Polish-Soviet Program in its particulars is connected to the need to introduce those undertakings contained in these documents in the annual and multi-annual national plans...

--In principle all tasks resulting from these programs will be contained in the system of our central research and development programs and government contracts. In both programs we want to create not only the mechanism for real applications of technical progress but also a source for realizing the common research and development work and applications introduced into production and mutual supplies. This statement of the matter results primarily from the conviction that we can attain the world technical standard in our country only in some fields. In the majority we will have to be content with a mean world level. Wherever we have legitimate goals of accelerating development in these fields we will have to attain them through licenses.

Scientific and technical cooperation with the the countries of the RWPG, especially with the Soviet Union, will serve our mutual advantage in forming the proportion between the world standard and the mean level of scientific and technical development in our countries.

[Interviewer] Thank you for this interview, and I wish you, Mr. Premier, and the committee successful realization of such ambitious aspirations.

12972

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EAST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

ACTIVITIES OF WARSAW POLYTECHNICAL SCHOOL INSTITUTE

Warsaw ELEKTRONIKA in Polish No 10, 1985 pp 3-4

[Article by Stanislaw Pytkowski, DSc (Eng), science director of Institute of Electronic Technology, Warsaw Polytechnical School: "15th Anniversary of the Institute of Electronic Technology of Warsaw Polytechnical School"]

[Text] On 1 Sep 1981 the Institute of Electronic Technology of Warsaw Polytechnical School marked its 15th anniversary. The Institute was created as a result of organizational changes in 1970 at Warsaw Polytechnical School when three departments that had been engaged in joint projects were combined into one entity: the Department of Electronic Instruments, the Department of Solid State Electronics and the Department of High Vacuums (footnote 1) (W. Wolinski, "10th Anniversary of the Institute of Electronic Technology of Warsaw Polytechnical School," ELEKTRONIKA, Vol 21, No 10, pp 3-7, 1980). The new Institute was given an opportunity for putting to work the combined scientific and educational potential to undertake new projects in the development fields of crucial importance for electronic technology. In the 15 years of its existence, the Institute has been involved in gradual organizational changes adapting its work to the emergence of new educational and research needs caused by the rapid and uninterrupted progress in the field of electronics. At the same time, the scientific and technical personnel has been growing numerically and qualitatively. The staff of the Institute today includes three professors, five associate professors and 37 instructors with a doctoral degree. Altogether the Institute staff numbers 180 employees plus 27 employees working in the research department of ZOPAP [not further identified].

Until the last days of his life, the godfather of Polish electronics, Prof. Janusz Groszkowski, worked at the Institute--wrote books, supervised work on doctoral dissertations, provided advice to his disciples.

Educational and scientific research work is conducted by educational-scientific departments where educators and scientists work together. Currently, these groups are working on the following scientific projects.

- Microelectronics Laboratory

--computer-assisted design of integrated circuits;

- modeling of semiconductor instruments and modeling and study of certain industrial processes used in microelectronics;
- the methods of diagnostics of semiconductor structures; and
- construction and analysis of semiconductor structures used for unconventional purposes (chemosensors, solar cells, etc.).

- Vacuum Technology Laboratory

- measurement and metrology of vacuum;
- rarefied gas currents; and
- equipment for analysis of the surfaces of solids.

- Laboratory of Microwave Equipment

- theory and design of microwave semiconductor medium- and low-power generators;
- measurement of semiconductor instruments and ferrite materials in microwave band;
- applications of microwave spectroscopy methods; and
- design and construction of microwave measurement equipment.

- Laboratory of Electronic Technology and Electronic Equipment Production

- study of effects occurring in materials used in passive electronic assemblies;
- technology of thin-film and thick-film hybrid systems and microwave technology of integrated circuits;
- measurement of thin films by ellipsometric techniques; and
- technology of thin-film passive elements of integrated optics.

- Laboratory of Magnetism and Dielectrics

- optimization and the construction of working conditions for lasers in measurement equipment;
- study of the parameters of magnetic, dielectric and semiconductor materials in microwave band;
- study of the piezoelectric and optical properties of ceramic materials;
- study of properties of ferrites;
- development of research methods and the design of equipment for measurement of nonelectric parameters;
- study of surface wave phenomena;
- study of reliability of electronic (ceramic) materials and passive electronic components.

● Laboratory of Optoelectronics

- optimization of the operation conditions and design of gas, ionic, molecular and solid state lasers;
- design of technological equipment with the use of lasers for microprobes of subassemblies and material heating;
- design of medical equipment with the use of lasers and coagulators for ophthalmic microsurgery;
- design of lasers for optoelectronic printers; and
- development of the technology of active and passive components in integrated optics.

● Laboratory of Image Processing

- theory and design of image analyzers, synthesizers and converters;
- theory and design of electronic connection instruments;
- computer-assisted design of electrooptical image converters;
- development of research methods and design of equipment for measurement of image converters and electronic connection instruments; and
- optimization and modeling of the optical properties of mirror analyzers and image amplifiers.

The members of the Institute staff also teach general subjects to all students in the Electronics Department and conduct classes for students specializing in electronic technology. Among the offerings are the following subjects: Semiconductor Equipment; Principles of Electronic Design; Principles of Semiconductor Electronics; Technology of Materials; Field Theory; Magnetism and Dielectrics; Microwaves; Principles of Electronic Technology; Principles of Vacuum Engineering; Principles of Optoelectronics; Electronic Connection Instruments; Principles of Microelectronics; Reliability of Electronic Components; and Methods of Solid State Research. In addition, lectures are presented on specific aspects in various fields of electronics.

Scientific and educational work conducted by the Institute includes basic research as well as projects closely related to the national economy. More than one-half of this work is conducted in the framework of the programs of Government Problems and Nodal Problems, while the other projects are initiated as suggested by research and production units. Some of the work is financed by the school's budget.

The results of research are published in Polish and foreign periodicals and reported at conferences within the country and abroad; altogether, 150-200 papers are produced annually.

The Institute works in cooperation with other research units of PAN [Polish Academy of Sciences] related to it by subject area, as well as industrial

ministries and institutes of other colleges and a number of foreign outfits. The research department of ZOPAP Institute is working in particular on industrial introduction of results in vacuum measurement technology.

The Institute is actively contributing to the nation's scientific life. The present director of the Institute, Professor Alfred Swit, is a member of PAN, a member of the Committee for Government Awards, Committee for Science and Technological Progress, Committee for Electronics and Telecommunications of PAN and Committee for Space Research of PAN. He is also chairman of the Scientific Board of the Institute of Electronic Technology of NPCP and a member of a number of scientific boards of other institutes. Other members of the Institute staff are also active members of scientific committees of PAN and their Academy sections, scientific boards of specialized ministerial institutes, program councils of technical journals, boards of scientific and engineering societies, committees of scientific conferences and are members of Polish delegations to CEMA councils.

The articles and communications published in this and subsequent issues of ELEKTRONIKA will offer readers a closer look at some of the scientific research projects currently conducted at the Institute of Electronic Technology of Warsaw Polytechnical School.

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EAST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

POLISH INSTITUTES CELEBRATE ANNIVERSARIES, NOTE ACHIEVEMENTS

Construction Mechanization Institute

Warsaw PRZEGLAD BUDOWLANY in Polish No 12, Dec 86 pp 571-572

[Article by Professor Ryszard Ciolek, Institute of Mechanization of Construction, Warsaw: "35th Anniversary of the Institute of Mechanization of Construction"]

[Text] In 1985 the Institute of Mechanization of Construction [IMB] marked its 35th anniversary. Between 1951 and 1972 it operated under the name of the Institute for Organization and Mechanization of Construction [IOMB], but since 1973, after reorganization, it has been working under its present name.

IMB is the only Polish scientific-research outfit working on the problems of mechanization in a comprehensive framework, i.e., both on applications of machines in construction, their technical operation and research as well as on efforts to intensify the manufacturing of these machines.

During the first years of its existence, the Institute based its work on its own research, as well as on the results of two of Poland's leading scientific outfits, namely:

--the Department for Organization and Mechanization of Construction at Warsaw Polytechnical School directed by Professor Aleksander Dyzewski and

--the Department of Construction and Road Machines of Warsaw Polytechnical School directed by Professor Ignaci Brach.

In its research and application efforts, the Institute promotes the development of mechanization in construction industry in Poland, including the development of Polish construction machine industry from the early days of the industry's development. Operating as a scientific research unit concerned with mechanization of construction and installation operations and the construction machines, IMB has made an important contribution to the revolution that took place in the postwar period in the Polish construction industry, which from a handicraft-type seasonal sector of the economy has transformed itself into a powerful industrial field based on large-scale highly mechanized construction operations both at construction sites and at permanent construction support facilities. This became possible in particular due to

the domestic development of the construction machine building industry, whose achievements and international prestige should be credited to cooperation of this industry with the Institute over the years.

Among the achievements of the Institute that enjoyed domestic and international renown are:

- initiative and participation in the creation and development of the theoretical principles and methods of practical application of technology design and organization of mechanized construction work;
- development and detailed statement of the theoretical principles and the practical introduction of comprehensive mechanization methods in Polish construction industry;
- the creation of a new original method for the study and evaluation of construction machines and machine complexes with the use of electronic computers and a large number of detailed investigative techniques which have currently been adopted for use by all scientific organizations concerned with analysis of construction machinery; and
- development and promulgation of a system of preventive scheduled maintenance and repair of machinery and construction facilities, adopted as mandatory procedures on a national scale.

Simultaneously, the Institute has been conducting research to advance and develop the scientific and theoretical principles in the areas necessary for implementing applied research in mechanization of production processes in construction, as well as manufacturing and operation of construction machines.

The activities undertaken by the Institute are concerned with major aspects of the economy, as represented in government programs, nodal problem-oriented projects and ministerial-industry problem-oriented projects, where IMB functions as the leading organization or as a participant. The Institute carries out its functions in cooperation with institutes of higher study, the Polish Academy of Sciences, institutes of industrial ministries whose activities involve construction and the industry of construction materials, as well as scientific research centers and design and development bureaus.

The institute is also engaged in scientific and technical cooperation in the framework of the Permanent Commission on Construction and Permanent Commissions of Engineering of CEMA and is cooperating with 10 related scientific-research units in socialist countries, as well as the European Economic Commission of the United Nations.

As a measure of the scientific prestige enjoyed by the Institute came the authorization it received in 1968 for awarding the degrees of a doctor of technical sciences in the field of mechanization of construction and construction materials industry.

The activities of the Institute encompass the following aspects:

- comprehensive mechanization of engineering processes in the basic construction-technological systems of residential, general, industrial and engineering construction;
- development and improvement of machines for groundwork, concrete laying, mounting, finishing and special construction transport;
- development and improvement of machines and production lines for the manufacturing of construction materials and, in particular, machines for the production of mineral mixes, concrete and construction components, cements and insulation materials;
- the management of machine stock and technological operation in the field of organization of machine maintenance and repair facilities, repair systems and technologies, diagnostic methods and diagnostic instruments, and machine component repair and restoration; and
- general activities in the development of technology and related work (personnel training, scientific, technical and economic information, and scientific and technical cooperation with foreign organizations).

IMB has a staff of more than 300, including six professors, seven associate professors and about 70 adjuncts and assistant scientists. This Institute has branches in Wroclaw and Poznan, as well as field laboratories in Krakow and Rzeszow. In addition, it has a laboratory base and an experimental department.

Members of IMB staff have been awarded for achievements in scientific research: two government prizes of the first degree in technology, 18 group awards by the Ministry of Construction and Construction Materials Industry, two group awards by the Ministry of Engineering Industry, five group and two personal awards by the Ministry of Science, Higher Education and Technology, two group awards by the Ministry of Food and Procurement Industry, 15 group awards and two individual awards by the Ministry of Construction and Construction Materials Industry.

The results of scientific-research work conducted by the Institute become fully implemented on a multiannual scale (preparing comprehensive mechanization for introduction into practice usually takes two to three years, and the startup of the production of a new or modernized machine three to five years). It can be estimated that most of the projects completed by the Institute in 1984 will find their way immediately into the national economy. In particular, in the framework of PR-5 program, the Institute has designed and forwarded for introduction 84 new machines and pieces of equipment, performed studies on 32 machine prototypes and five models of foreign-produced machinery. Between 1976 and 1984, production has been started of 84 new machines, including 14 machines for groundwork and excavation, 12 for mounting and installation, 27 for concrete-laying, 20 for finishing operations and 11 specialized transportation vehicles. As a result of these innovations, the construction industry has received in this period more

than 9000 machines, 380,000 smaller equipment units and tools, and more than 2500 tons of restored components of construction machines.

- In the field of publishing, IMB personnel have produced the following: 300 books (including 275 original works), 178 papers presented at conferences, 148 articles published in scientific and technical periodicals (including foreign-published) and 226 articles popularizing scientific and engineering achievements. In addition to its book publishing operation, IMB publishes a quarterly, which in 1982 became a scientific-technical journal titled PROBLEMY MECHANIZACJI BUDOWNICTWA. In the framework of its publishing operations, IMB has created a Scientific Library, which is a program publishing works of a high scientific quality. In addition, IMB edits its own separate inserts in the periodicals PRZEGLAD MECHANICZNY and PRZEGLAD BUDOWLANY.

- In the field of inventions, IMB has filed 60 patent applications with the Patent Office; other results are being prepared for patenting.

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The Institute of Mechanization of Construction is working to meet the needs of enterprises and organizations in construction industry, production of construction materials and construction machines and coordinates its work with the principles of the economic reform and the requirements advanced by the development trends of these industries. The Institutes also coordinates its work with the units of central construction administration and education in mapping out the development policies in mechanization of construction and the manufacture of construction machinery.

The diverse activities of the Institute of Mechanization of Construction in Poland and abroad has made it possible to establish a scientific and technological discipline in the area of construction mechanization and construction engineering and to integrate the scientific and engineering community working in this area.

PHOTO CAPTION

p 571. Headquarters of the Institute of Mechanization of Construction on Razionalizacji Street in Warsaw.

Precision Mechanics Institute

Warsaw PRZEGLAD MECHANICZNY in Polish No 5, Mar 86 pp 1-2

[Article by H.K.: "40th Anniversary of the Precision Mechanics Institute: A Festive Scientific Session"; the first paragraph is an introduction]

[Text] On 15-16 Oct 1985 a festive scientific session was held at the Palace of Culture and Science in Warsaw on the occasion of the 40th anniversary of

the Precision Mechanics Institute [IMP]. The session comprised three seminars: Seminar XII in metal studies and thermal treatment, Seminar XII [as printed] on protective coatings and Seminar III on industrial robots. The subjects covered by the session reflected the broad scope of the Institute's activity, as formed during the past 15 years.

In its early days, the Institute was working on various problems, but only in 1954, after the merger of the Institute of Metal Science and Research Laboratory Equipment and the Institute of Precision Mechanics, did it become a scientific research center of a character similar to its present status. The Precision Mechanics Institute today is a scientific research organization operating as the scientific research base of the Ministry of Metallurgy and Engineering in the areas of thermal treatment, protective coatings and industrial robots.

The staff of the Institute numbers almost 1000, including 31 professors and associate professors, nearly 200 auxiliary scientific research staff and more than 400 engineering-technical personnel. The IMP staff is characterized by high professional and ethical standards; another trait is low personnel turnover. The average length of employment with the Institute for a member of the scientific research staff is 15 years.

In appreciation of the scientific status of the Institute, it has been authorized to award the degrees of doctor and habilitated doctor of technical sciences. Up until now, the scientific board of the Institute has awarded doctoral degrees to 67 individuals, including foreign scientists, in particular from Cuba and Bulgaria.

Throughout the 40 years of its existence, the Institute has been working on and giving priority to the subjects of a major importance to the national economy. Among the priority areas was the development and introduction of projects that allow a saving of material and power. Billions have been saved as a result of implementation of these developments, in particular by using the thermal treatment processes in protective and controlled atmospheres.

One example of this effort is the original technology and equipment for selective nitriding of tools, which combines the merits of oxidation in water vapor and conventional nitriding, but is free of the latter's major flaw--the increased brittleness of the nitrided layer. The cost of the process is just 15 percent of the cost of hardening and triple tempering. The average increase in durability as a result of selective nitriding is nearly 100 percent. The technology is being used by more than a dozen industrial enterprises.

High-speed steel SW3S2 is being used at scores of industrial enterprises. The developers of this steel, well cognizant of the current needs of the economy, have largely replaced in it expensive tungsten and molybdenum with inexpensive silicon. The new grade comes to replace conventional steel grades which are twice or three times as expensive. SW3S2 contains 2.5

times less alloy additives (Mn, W) than the conventional grades of high-speed steel. An additional advantage is a good segregation of carbides on large profiles, a good resistivity to tear and high durability and plasticity.

A highly efficient electrogalvanizing process has also been introduced, where the coating is done directly in the bath, including the nickel-plating in KG baths based on surfacing-polishing substances developed and manufactured at IMP, which makes it possible to produce nickel-plating with high glossiness and smoothness characteristics at a rapid speed of the nickel-coating process of 0.5-1 $\mu\text{m}/\text{min}$. The advantages of this process include the bath resistance to impurities, the elimination of grinding-polishing operations after nickel-plating and the savings in labor, energy and polishing materials. This technology in KG baths is used by electroplating plants all over the country, especially in the automobile industry.

Realizing that the future development of industry, its technological and organizational standards will depend increasingly on the level of automation and robotization of the manufacturing systems, the Institute in 1976 initiated work toward the introduction of manipulators and industrial robots into Polish industry. Thanks to dedicated work, the first simple robot prototypes RIMP-400 were made already in December of 1976. Subsequently, the production was launched of composite robots RIMP-1000, modular robots RIMP-402 and specialized robots for application of paint coatings RIMP-901.

An important area of the Institute's work is environmental protection and improvement of working conditions. Examples of these projects are the technology of thermal treatment in a vacuum; the vacuum is used as an environment for the thermal processes instead of natural atmosphere, inert gases, regulated atmosphere or a salt bath. The vacuum technology has eliminated various problems confronted by the use of conventional hardening of tools in salt baths. The processes developed at IMP make it possible to harden tools (tools of a complex configuration), as well as annealing, degassing, brazing and sintering of metal mixes.

Other instances of technical solutions promoting environmental protection and improving industrial safety and hygiene are cyanide-free and low-concentration galvanic baths and methods for treatment of effluents from recovery of precious metals, known as FJKJA/LAFT methods. This method, which has been patented in Poland and abroad and is unique on a world scale, is a system for processing toxic effluent and semisolid industrial waste containing cyanides and heavy metals such as Ag, Cu, Cd, Zn, Ni, Au, etc. The process makes it possible to treat effluents and spent concentrated baths, solutions and sediments at electroplating plants, tanneries, waste from thermal treatment of metals, photographic processes, etc.

In evaluating the results produced by the Institute, it should be emphasized that its work is characterized not only by high scientific standards but also by its utility for the national economy. Altogether, since 1961 the Institute

has introduced into industry about 1400 original products and processes used at about 3800 industrial enterprises in the country, over a dozen new grades of steel and iron, dozens of new types of protective coatings and means of temporary anticorrosive protection.

Major achievements indicating that the work of IMP is original and up-to-date have been covered by patents. Between 1961 and 1985 the members of the Institute staff have registered 670 patents and industrial designs.

The Institute has been maintaining lively scientific and technical cooperation with foreign countries in its field, especially in the CEMA framework. As a sign of recognition of its rank and level of work at the Institute, members of its staff have been appointed to important positions in international organizations and have been members of delegations of these organizations.

For a period of over a decade, the Precision Mechanics Institute has been selling its results, products and licenses abroad, as well as in Poland. In 1983, on the basis of a concession granted by the Ministry of Foreign Trade, the Institute was authorized to conduct foreign trade on its own.

This brief summary of the products of 40 years of activity of the Precision Mechanics Institute can be completed by a brief definition of the most important aspect--the Institute's contribution to the development of Polish science and industry. Above all, it should be clearly stated that the choice of basic fields of research by the Institute over the years has proved to be correct. Over time and particularly in the last few years, it has been clear that the projects implemented by the Institute have a major importance for the economy and produce significant economic effects. For this reason, the Institute will proceed to develop these trends consistently, in accordance with the needs of the national economy and the world trends.

The activities of the Precision Mechanics Institute have contributed substantially to the upgrading of industrial standards in thermal treatment and protective coatings. By introducing its research results into industry, IMP has practically eliminated the "gray spots" on the map of its applications. The standards of technologies developed by IMP make them suitable for use in all products manufactured by renowned world companies.

PHOTO CAPTIONS

- p 1. During the academic festivities, which took place on 19 Dec 1985, at the Institute, a group of long-time members of IMP staff received government and ministerial decorations. Officer's Cross was awarded to director of the Institute Prof. Jerzy Buc (first left) and the Chivalry Cross was awarded to, among others, Prof. Jozef Brodacki, head of the Laboratory of Special Technology (center), and Prof. Tadeusz Burakowski, assistant director for metals science.
- p 2. Participants in the seminar on protective coatings.

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